19 May 2006

Mr. Bob Boggs
California Department of Toxic Substances Control
700 Heinz Avenue, Suite 200
Berkeley, CA 94710-2721

Subject: Draft Work Plan, Additional Sampling for Completion of Site Characterization at Fill Site 6B, dated 19 May 2006
Presidio of San Francisco, California

Dear Mr. Boggs:

Enclosed please find one hard copy and one electronic copy of the *Draft Work Plan, Additional Sampling for Completion of Site Characterization at Fill Site 6B, Presidio of San Francisco, California* prepared by CDM Federal Programs Corporation for the Presidio Trust (Trust). This report presents a redefinition of site boundaries for Fill Site 6B and the approach and rationale for a soil sampling investigation in support of site characterization activities. In a meeting on 19 October 2005, we presented the general approach to the redefinition of Fill Site 6B and the sampling program. The enclosed Work Plan incorporates comments received during this meeting.

We would like to proceed with the field sampling program at Fill Site 6B in July 2006. To assist in your review of this Work Plan, we propose to conduct an onsite meeting and site walk in the near future to visit the proposed field locations and discuss the data quality objectives (DQOs) for the project.

Please contact me at (415) 561-4259 if you have any questions.

Sincerely yours,
The Presidio Trust

Craig Cooper
Environmental Remediation Manager

Enclosure

Cc (with enclosure):
Devender Narala, Regional Water Quality Control Board (RWQCB)
Brian Ullensvang, National Park Service (NPS)
Doug Kern, Restoration Advisory Board (RAB)
Mark Youngkin, RAB

Presidio of San Francisco
San Francisco, California
Work Plan

Additional Sampling for Completion of Site Characterization at Fill Site 6B

May 19, 2006

Prepared for:

The Presidio Trust
San Francisco, California

Prepared by:

CDM Federal Programs Corporation
100 Pringle Avenue, Suite 300
Walnut Creek, California 94596

Draft

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Acronyms and Abbreviations

AST	above ground storage tank
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAP	Corrective Action Plan
CDM	CDM Federal Programs Corporation
CRWQCB	California Regional Water Quality Control Board
DQO	data quality objective
EKI	Erler & Kalinowski, Inc.
EPA	Environmental Protection Agency
FDS	fuel distribution system
FEPZ	freshwater ecological protection zone
FS	fill site
IDW	investigation derived waste
IT	International Technology Corporation
LMAC	Letterman Army Medical Center
MS/MSD	matrix spike/matrix spike duplicate
µg/L	micrograms per liter
mg/L	milligrams per liter
MTBE	methyl-tert butyl ether
OCP	organochlorine pesticides
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PLLW	Presidio Lower Low Water
PPE	personal protective equipment
PRG	preliminary remediation goal
PID	photoionization detector
PTMP	Presidio Trust Management Plan
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RAP	remedial action plan
RI	remedial investigation
RU-B	remedial unit B

Acronyms and Abbreviations (continued)

SAP	sampling and analysis plan
SCR	site cleanup requirement
SOP	standard operating procedure
SOW	scope of work
SVOC	semivolatile organic compound
TDS	total dissolved solids
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TPHd	TPH as diesel
TPHfo	TPH as fuel oil
TPHg	TPH as gasoline
TPHg/d/fo	TPH as gasoline, diesel, and fuel oil
U.S. EPA	U. S. Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound

Section 1
Introduction

This work plan, prepared by CDM Federal Programs Corporation (CDM) for the Presidio Trust (the Trust), presents the approach and rationale for a soil sampling investigation in support of site characterization activities at Fill Site 6B (FS6B) at the Presidio of San Francisco, California. The location of FS6B on the Presidio is shown in Figure 2-1.

The Trust is in the process of preparing Remedial Action Plan 5 (RAP5) that addresses eight Presidio sites including FS6B. During preliminary work leading to preparation of the RAP5 document, it was determined by the Trust that further characterization of FS6B soils is needed so that remedial actions for FS6B can be assessed and described in RAP5. Data and information gathered as described in this document will be incorporated into the RAP5 document, currently scheduled for release in 2007.

This document serves two primary purposes leading to the completion of site characterization and remedy identification for FS6B. These are: (1) the delineation of subareas within FS6B requiring further characterization and (2) a presentation of the field sampling approach to complete site characterization within the FS6B subareas.

This work plan is organized as follows:

- Section 1.0 provides an introduction and description of the contents of this work plan;
- Section 2.0 provides background information for FS6B, information regarding site soil and groundwater contamination and geology and hydrogeology, and identified data gaps;
- Section 3.0 introduces the data quality objectives (DQOs) for the proposed field sampling approach at FS6B;
- Section 4.0 provides the field investigative approach;
- Section 5.0 includes the field methods to be used for this investigation and a tentative schedule; and
- Section 6.0 provides the references cited in this work plan.

Section 2
Site Background

This section presents background regarding FS6B, including past usage and geology and hydrogeology of the site.

2.1 Site Description

Fill Site 6 (FS6) (subsequently divided into Fill Site 6A [FS6A] and FS6B as described below) was originally defined during Army investigations as the area between existing Buildings 1016 and 1047 containing debris from the demolition of the Letterman Army Medical Center (LAMC) in 1975. This area now serves as a parking lot adjacent to existing Buildings 1027 and 1028 to the west, existing Buildings 1007, 1008, and 1009 to the east, existing Building 1047 to the north, and existing Building 1016 to the south (Figure 2-1).

Erler & Kalinowski, Inc. (EKI), as part of the effort to develop the *Presidio Trust, Revised Feasibility Study, Main Installation Sites* (Main Installation Feasibility Study; EKI 2003), determined that other buildings in the vicinity of the LAMC were demolished during the same time period. EKI surmised that the locations of those other buildings could also contain buried demolition debris; thus the area comprising FS6 was expanded. EKI used the definition of "generalized area identified as landfill site, fill site, or disturbed area (e.g., imported soil, debris, or municipal waste)" and "generalized area suspected as landfill site, fill site, or disturbed area (e.g., imported soil, debris, or municipal waste)" to delineate FS6 (see Figures 6-10A and 6-10B of the Main Installation Feasibility Study). Additional sampling performed by the Trust in the area of FS6, including the Building 1065 area, indicated that the area bound by existing Buildings 222, 223, 224, and 225 to the west, Lincoln Boulevard to the south, Girard Road to the east, and Building 1030 to the north, contained polychlorinated biphenyls (PCBs) and mercury above cleanup levels. This area was thereafter referred to as FS6A, with the remainder of the FS6 area referred to as FS6B (see Figure 2-1).

In the Main Installation Feasibility Study, EKI (2003) identified soil and fill removal as the proposed remedial action for FS6A, but did not develop conclusions regarding a remedy for the remainder of FS6 (now FS6B) due to an absence of site characterization data for many locations within the FS6B area.

2.2 Redefinition of Fill Site 6B

CDM has been tasked by the Trust to refine the definition of FS6B based on numerous investigations and remedial actions performed by both the U.S. Army and the Trust and the primary definition of FS6B as areas "potentially containing fill from building

demolition." The information and processes used by CDM to refine the FS6B definition are summarized in the following sections.

2.2.1 Army Investigations and Remedial Actions

Army Investigations

In response to the findings of the *Enhanced Preliminary Assessment Report* (Argonne National Laboratory 1989), the Army conducted several investigations of Main Installation sites, including the Initial Remedial Investigation (RI) conducted in 1990, the Supplemental RI conducted in 1992, and the Follow-on RI conducted in 1994 and 1995. Results of these investigations are reported in *Final Remedial Investigation Report, Presidio Main Installation, Presidio of San Francisco* (Main Installation RI Report), Dames & Moore 1997a). Army investigations pertaining to the FS6 area included, but are not limited to:

- FS6 parking lot soil samples collected during the 1990 Initial RI and 1994 Follow-on RI (Dames & Moore 1997a).
- Building 1065 Area (including Buildings 1040, 1042, 1062, 1063, 1064, 1065, and 1066) soil borings and hydropunch testing performed during 1990 Initial RI and 1994 Follow-on RI (Dames & Moore 1997a).
- Building 1065 soil gas survey performed in 1996 (International Technology Corporation [IT] 1996).
- Building 1065 soil and groundwater samples collected during the Building 1065 site investigation performed in 1997 (IT 1997b).

Army Remedial Actions

The Army also completed cleanup activities in the FS6 area including:

- Removal of PCB-containing transformers at Building 1040 (A/C Industrial Cleaning Company 1991).
- Removal of two aboveground storage tanks (ASTs) at Building 1040 in 1996 (IT 1997a; Montgomery Watson 1998b).
- Removal of petroleum underground storage tanks (USTs) at Building 1027 (Montgomery Watson 1998a), Building 1029 (Montgomery Watson 1998b and 1999), and Building 1030 (Montgomery Watson 1999).
- Removal of approximately 45,000 linear feet of underground fuel distribution system (FDS) lines (IT 1999); however only a minor portion of the FDS line was within the area of FS6.

2.2.2 Trust Investigations and Remedial Actions

Following the Army's Final Feasibility Study in 1997 (Dames & Moore 1997b), the Trust retained EKI to produce the *Alternate Remedial Actions for Presidio Main Installation Sites and Public Health Service Hospital Sites* (EKI 1998). This report was prepared to describe how remedial actions for the Main Installation sites, including FS6, should satisfy evaluation criteria under the National Contingency Plan and to assist the Trust with its negotiations with the Army to assume responsibilities for environmental restoration of the Presidio. The Trust subsequently retained EKI to prepare the Main Installation Feasibility Study (EKI 2003). The Main Installation Feasibility Study was prepared to develop remedial actions that are protective of human health and the environment, cost-effective, and allow reuse as intended under the Presidio Trust Management Plan (PTMP; Presidio Trust 2002) and the Final General Management Plan Amendment (Department of the Interior, National Park Service 1994).

Trust Investigations

The Trust has conducted investigations at FS6 to address issues that remained after the Army investigations. These investigations include:

- Soil and groundwater sample collection from FS6 in July and August 2000 (EKI 2000);
- Trenching and soil sampling from FS6 in February 2001 (EKI 2001);
- Additional site investigations performed at the Building 1065 Area in 2002 (MACTEC 2003), and
- Data Gaps Investigation performed at the Building 207/231 Area in 2004 (MACTEC 2004b).

Trust Remedial Actions

The Trust has performed remedial actions within the FS6 boundaries including:

- Phase I Interim Action Building 1065 Area (MACTEC 2004a) and
- FS6A Remedial Action in 2005 (Treadwell & Rollo 2004).

The Trust also plans to conduct remedial actions associated with petroleum release sites in the vicinity of FS6B, under the following Corrective Action Plans (CAPs):

- Draft CAP, Building 1065 Area (MACTEC 2005a), and
- Draft CAP, Building 207/231 Area (MACTEC 2005b).

Locations where sampling was performed during these investigations within the FS6 area, including hydropunch, groundwater monitoring wells, piezometers, soil borings, and test pits; together with areas where removal actions have been performed are

shown on Figure 2-2. The predominant contaminants that have been detected in soil within the FS6 area include metals (arsenic, cadmium, and lead), polycyclic aromatic hydrocarbons (PAHs), PCBs, pesticides, and total petroleum hydrocarbons (TPH).

2.3 Rationale for Redefinition of Fill Site 6B

The Trust tasked CDM to redefine areas to be included within the definition of FS6B as areas "potentially containing fill from building demolition." EKI had initially circled locations (shown in pink on Figures 2-1 and 2-2) where buildings had been demolished and then broadly incorporated the pink locations into a larger area (the curvilinear black line on Figures 2-1 and 2-2). The broader area, however, was drawn through buildings that were present in 1975 when the majority of buildings were demolished and it also incorporated roadways that were present in 1975. Because historic buildings and roadways constructed prior to 1975 could not exist above buried building debris from 1975, CDM used that consideration as one factor in redefining the FS6B boundaries.

The proposed definition of the FS6B boundaries are shown in orange on Figure 2-3. Also shown on Figure 2-3 are the boundaries of CAP and remedial action areas in the vicinity of FS6B:

- Building 207/231 CAP Area
- Building 1065 CAP Area
- FS6A.

In general, adjustments to EKI's FS6B boundaries include:

- The removal from FS6B delineation of buildings that have been in existence since before the buildings within the FS6B area were demolished. This includes removal from FS6B delineation of all or portions of Buildings 1016, 1009, 1040, 1063, 1163, 1167, 224, and 225 (starting from the southeastern portion of Figure 2-2 and proceeding counter-clockwise).

- The removal from FS6B delineation of streets that have been in existence since before the buildings within the FS6B area were demolished. This includes (starting from the southeastern portion of Figure 2-3 and proceeding counter-clockwise) portions of General Kennedy Avenue, Edie Road, Gorgas Avenue, Halleck Street, Lincoln Blvd., and Girard Road.

- The inclusion of some areas into the FS6B delineation that were excluded as part of the EKI broader definition of FS6B. This includes (starting from the southeastern portion of Figure 2-3 and proceeding counter-clockwise) the portion of the FS6 parking lot located directly north of Building 1016, the currently vacant area southwest of the intersection of Edie Road and General Kennedy Drive, the

triangular area at the northern corner of the Building 1065 CAP Area, the triangular area at the southwestern corner of Building 230, and the parking lot at the southeast corner of Lincoln Blvd. and Funston Avenue and south of FS6A.

- Areas of previous excavations are excluded from the proposed redefinition of FS6B. These include:

  - The area excavated under Phase I Interim Action of the Building 1065 CAP Area located south of Building 1063, west of Building 1062, north of Building 1040, and east of the parking area located in the northwest corner of the CAP Area.

  - The area excavated at the northwest corner of Building 1040 as part of the removal of ASTs 1040.1 and 1040.2.

  - The area excavated at the northwest corner of existing Building 1027 during removal of the UST at this location.

  - The area excavated at the northwest corner of existing Building 1029 during removal of the UST at this location.

  - The area excavated at the southeast corner of existing Building 1030 during removal of the UST at this location.

The newly defined area of FS6B has subsequently been divided into subareas 6B1 through 6B8 (A through C) and 6B9, as shown on Figure 2-3 and described below:

- Subarea 6B1 includes the area of former Buildings 1010, 1011, and 1082.

- Subarea 6B2 includes the area of former Buildings 1006 and 1049.

- Subarea 6B3 includes the parking lot to the west of subareas 6B1 and 6B2 and east of existing Buildings 1027 and 1028.

- Subarea 6B4 includes the area of former Buildings 1017, 1018, 1019, 1023, 1025, 1027, 1029, 1031, 1037, 1038, 1039, and existing Buildings 1027 and 1028.

- Subarea 6B5 includes the area of former Buildings 266, 270, 1032, 1033, 1034, 1070, 1071, and existing Buildings 1029 and 1030.

- Subarea 6B6 includes the area of former Building 219 and a building shown on Presidio maps dated July 1934.

- Subarea 6B7 includes the area of former Buildings M19, M28, M34, and existing Building 1165.

- Subarea 6B8 includes portions of the 1065 CAP Area. Subarea 6B8 has been further divided into three portions. The northern portion (along Gorgas Drive, 6B8C) and the southern portion (centered over the location of former Building 1035, 6B8A) have had little or no investigation to date. The third portion of 6B8, the parking lot to the west of Buildings 1062 and 1063 (6B8B), has been investigated under the CAP for the Building 1065 Area.

- Subarea 6B9 includes the YMCA parking lot due south of FS6A. Monitoring well LF6GW105 was installed in this parking lot under the groundwater monitoring program stipulated in the *RAP for Fill Site 6A and Baker Beach Disturbed Areas 3 and 4* (Treadwell & Rollo 2004). Soil samples collected from the boring for this well exhibited concentrations of metals exceeding cleanup levels (the results for these samples will be reported in the *Fill Site 6A Construction Completion Report* [MACTEC 2006, pending]). Fill material including chert, brick, and concrete fragments were encountered in the boring to a depth of approximately 12.5 feet below ground surface (bgs). Based on review of historical Presidio maps, as much as 20 feet of soil has been placed at this location to bring the parking lot to the same grade as Funston Avenue and Lincoln Blvd. Maps and photographs indicate that there has never been a building situated at this location; therefore the fill material was brought in from other locations and cannot be attributed to demolition of a building in-place. It is estimated that this area was filled sometime in the 1950's.

2.4 Site Geology

Investigations at FS6 (specifically subarea 6B3 that includes the parking lot east of existing Building 1028) conducted during the Army's RI at the Presidio Main Installation (Dames and Moore 1997a) indicated that below pavement or surficial soils, debris fill overlies native deposits interpreted as belonging to the Colma Formation. Debris encountered included wood, brick, concrete, ceramic tiles, and asphalt roofing materials. The debris material was found at a maximum thickness of 7 feet (Dames and Moore 1997a). The native deposits described as belonging to the Colma Formation included clayey silty sands and well sorted sand with minor clay layers. Bedrock Franciscan Formation is estimated to occur beneath FS6 at approximately 175 feet bgs.

Geologic conditions in the vicinity of Building 1065 were described in the *Draft CAP, Building 1065 Area* (MACTEC 2005) as follows:

> Fill is present throughout the site but the underlying shallow sand unit is not present at all locations. The shallow sand or fill units are underlain by a fine-grained aquitard consisting of shallow Bay Mud or silt, sandy silt, or silt with sand. The shallow Bay Mud appears to be confined to the northern portion of the site and in the southern part of the site the aquitard is dominantly comprised of silt. The transition between Bay Mud

and the silt aquitard probably represents a facies change between Beach Dune and Colma Formation.

In the borings drilled by MACTEC, the underlying intermediate sand unit is dominantly composed of silty sand. Because the intermediate Bay Mud was not encountered in the borings drilled for this investigation, there does not appear to be a separate (deep) groundwater zone below 28 feet bgs. The "intermediate sand" therefore, appears to extend to depths of 38.5 feet bgs or deeper.

2.5 Data Gaps

This section presents data gaps identified based on a review of historical data collected at FS6B and the surrounding area. The previous sample locations are shown in relation to the FS6B subareas on Figure 2-4.

2.5.1 Soil

FS6B Subareas 1, 2, 6, and 7

There have been no investigations within these subareas of FS6B. Soil samples to characterize the potential fill material will therefore need to be collected in each of these four subareas. See Sections 3 and 4 for discussion of proposed soil sampling in these subareas of FS6B.

FS6B Subareas 4 and 5

There is one groundwater monitoring well located within each of FS6B subareas 4 and 5. Well LF6GW101 is located in FS6B4 and LF6GW103 is located in FS6B5. Both of these wells, together with wells LF6GW100 (located in FS6B3) and LF6GW102 (formerly located in FS6A but abandoned prior to the remedial action performed at FS6A), were installed by the Trust during July 2000. No debris was observed in the soil from the boring for well LF6GW101, but a minor amount of building debris was evident in soil from the boring for well LF6GW103. Concrete, brick, and mortar fragments were observed in soil (at less than 5 percent by volume) in the boring for well LF6GW103 (EKI 2003). Soil samples were not collected from the soil borings drilled for installation of these wells. Soil samples will therefore need to be collected from these two subareas of FS6B. See Sections 3 and 4 for discussion of proposed soil sampling in these subareas of FS6B.

FS6B Subarea 3

FS6B3 is the parking lot located to the east of Building 1028. This area was investigated during the Initial RI in 1990 and the Follow-on RI in 1994 and results were reported in

the Main Installation RI Report (Dames & Moore 1997a). Three soil borings (LF6SO01, LF6SO02, and LF6SO03) were drilled during the Initial RI and two soil samples were collected from each boring. The shallow samples were collected from fill material and the deep samples were collected from native Colma Formation soils below the fill. All samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals. Metals were detected above reporting limits in all samples. The only VOCs detected were 1,1,1-trichloroethane and trichlorofluoromethane in the sample collected from Colma Formation in LF6SO03. Trichlorofluoromethane was also detected in the sample collected from the fill material in LF6SO03. No SVOCs were detected above reporting limits. Fill material was encountered to a depth of 7 feet bgs in all three of these borings.

Six soil borings (LF6SB01 through LF6SB06) were drilled during the Follow-on RI to further assess the soil at the site and to evaluate the extent of the VOCs detected during the Initial RI (Dames & Moore 1997a). Soil samples were collected from each boring at depths of approximately 3, 8, and 20 feet bgs. All 18 of these samples were analyzed for metals, trichloroethylene and its breakdown products, trichlorofluoromethane, PAHs, TPH as diesel (TPHd), and TPH as gasoline (TPHg). Except for the 3-foot samples from borings LF6SB01 and LF6SB04, all soil samples were collected from Colma Formation soil. Concentrations of metals were all below Presidio residential PRG cleanup levels.

Boring LF6SB07 was drilled to a depth of 45 feet bgs and three samples were collected for analysis of total organic carbon only.

Discrete groundwater samples were collected from borings LF6SB08 through LF6SB11, also drilled during the Follow-on RI. Groundwater is discussed in the following subsection.

FS6B3 has been adequately characterized for remedy identification; therefore, no additional sampling is proposed in FS6B3.

FS6B Subarea 8

As discussed in Section 2.3 above, FS6B8 (the parking lot area west of Building 1063) has been further divided into three subsections: FS6B8A, FS6B8B, and FS6B8C. FS6B8 overlaps with a portion of the area investigated as part of the Building 1065 Area CAP (MACTEC 2005a). Within the FS6B8 area, 20 soil borings were drilled, 6 test pits were dug, 1 monitoring well and 4 piezometers were installed, and hydropunch samples were collected at eleven locations.

Significant findings from this investigation include those locations where Building 1065 Area cleanup levels were exceeded within the freshwater ecological protection zone

(FEPZ) and in areas designated as ecological buffer zone in the parking area in the vicinity of former Building 1066 (i.e., coincident with FS6B8):

- 1065SB132 – TPH as fuel oil (TPHfo) at 600 milligrams per kilogram (mg/kg), TPHd at 190 mg/kg, benzo(a)pyrene at 0.075 mg/kg, cadmium at 1.9 mg/kg, selenium at 0.64 mg/kg, and lead at 310 mg/kg at 2 feet bgs; and cadmium at 1.9 mg/kg and selenium at 0.63 mg/kg at 5.5 feet bgs;
- 1065SB114 – TPHfo at 420 mg/kg, unknown hydrocarbons in the diesel range at 120 mg/kg,; TPHfo at 930 mg/kg, TPHd at 200 mg/kg, barium at 690 mg/kg, cadmium at 1.4 mg/kg, zinc at 970 mg/kg, selenium at 0.61 mg/kg, and lead at 560 mg/kg at 6 feet bgs;
- 1065SB113 – TPHfo at 430 mg/kg, unknown hydrocarbons in the diesel range at 180 mg/kg;
- 1065SB120 – TPHfo at 390 mg/kg, unknown hydrocarbons in the diesel range at 130 mg/kg at 2.5 feet bgs;
- 1065SB30 – TPHfo at 300 mg/kg, TPHd at 202 mg/kg, and TPHfo at 250 mg/kg and TPHd at 420 mg/kg in a field duplicate sample at 3 feet bgs;
- 1065SB14 – TPHfo at 163 mg/kg at 7.3 feet bgs;
- 1065SB22 – TPHfo at 170 mg/kg at 3 feet bgs;
- 1065PZ4A –TPHfo at 150 mg/kg at 3 feet bgs; and
- 1065SB29 – TPHfo at 220 mg/kg at 4 feet bgs in a split sample.

Cleanup levels were exceeded at the following locations outside of the FEPZ and ecological buffer zone in the parking area in the vicinity of former Building 1066 (i.e., coincident with FS6B8):

- 1065TP129 (Test Pit A1) – TPHfo at 170 and lead at 590 mg/kg at 5.5 feet bgs;
- 1065SB111 – TPHfo at 1,300 mg/kg at 2.5 feet bgs, unknown hydrocarbons in the diesel range at 320 mg/kg at 2.5 feet bgs;
- 1065SB13 – Benzene at 0.037 mg/kg at 7.2 feet bgs;
- 1065SB112 – Lead at 4,200 mg/kg at 5.5 feet bgs; and
- 1065EX50 – TPHfo at 220 mg/kg at 5 feet bgs.

Detected VOCs included 2-butanone, acetone, carbon disulfide, 1,1,2,2-tetrachloroethane, benzene, ethylbenzene, dibromochloromethane, and bromoform. There were no cleanup level exceedances for VOCs other than benzene, and no exceedances for PAHs other than benzo(a)pyrene.

Based on these results, the Trust designated those soils beneath the parking lot area west of Building 1066 in which analytes were found to exceed cleanup levels as "Soil Remedial Unit B" (RU-B) of the Building 1065 Area CAP. This area is shown on Figure 2-3 of this work plan. A review of the Building 1065 Area CAP data coincident with FS6B8 indicates that adequate data exist for the central portion (FS6B8B) of RU-B, but

that additional data are required in order to define the northern and southern extent of RU-B. Thus, the lateral characterization of soil contamination in RU-B needs to be extended to the north (into FS6B8C) and to the south (into FS6B5) where additional sampling is proposed.

Results of analysis of samples collected from proposed sampling locations in FS6B8A and FS6B5 will be combined with results for FS6B8B to complete the characterization of RU-B.

Fill Site 6B Subarea 9

The Trust installed three groundwater monitoring wells (LF6GW104 through LF6GW106) in November 2005 to monitor groundwater associated with FS6A. These wells are shown on Figure 2-4 of this work plan. LF6GW104, located within the FS6A excavation, encountered fill material to a depth of approximately 5 feet. LFGW106, located to the west of the FS6A excavation, encountered fill material to a depth of approximately 11 feet bgs. LF6GW105, located in the parking lot at the southeast corner of Lincoln Boulevard and Funston Avenue (the YMCA parking lot), encountered fill material to a depth of approximately 12.5 feet.

Based on review of historical maps for the years 1897, 1907, 1942, 1947/1948, and 1961, this area was filled between 1948 and 1961. The 1934-era and current topographic contour maps of the YMCA parking lot area were compared to delineate the "likely extent of fill" in this area. This area is shown on Figure 2-3.

Soil samples collected from LF6GW105 (at 6.5 and 10 feet bgs in fill material, and at 16 feet bgs in native material) and LF6GW106 (at 3 feet bgs in fill material and at 15.5 feet in native material) were analyzed for Title 22 metals by U.S. Environmental Protection Agency (EPA) SW-846 Method 6010B except for mercury which was analyzed using U.S. EPA SW-846 Method 7471A. Arsenic, chromium, lead, mercury, and zinc were detected at concentrations exceeding cleanup levels in at least one of the samples collected from LF6GW105. The results for these samples will be reported in the *Fill Site 6A Construction Completion Report* (MACTEC 2006, pending).

Based on the existence of fill materials found in subsurface soil and the exceedance of cleanup levels of several metals in soils at this location, additional sampling is proposed for FS6B9.

2.5.2 Groundwater

Groundwater is sampled basewide on a quarterly basis at the Presidio. Groundwater monitoring wells at FS6, and within the Building 1065/1027 and Building 231/207 Areas are included in the quarterly sampling events. FS6 and the Building 1065/1027 Area are located in the Northeastern Groundwater Area of the Marina Groundwater

Basin. The Building 231/207 Area is on the border of the Northeastern and Crissy Field Groundwater Areas within the Marina Groundwater Basin.

The following sections provide summaries of the groundwater conditions at FS6, the Building 1065/1027 Area, and the Building 231/207 Area. The information presented below has been compiled from the *Draft Semi-Annual Groundwater Monitoring Report, Third and Fourth Quarters 2005, Presidio-wide Quarterly Groundwater Monitoring Program* (Treadwell & Rollo 2006).

Fill Site 6

Five groundwater monitoring wells (LF6GW100, LF6GW101, LF6GW102, LF6GW103, and 231GW09 [downgradient FS6A well]) have been sampled in association with FS6 since July 2000 except for 231GW09 which has been sampled since January 1997. Monitoring well LF6GW102 was abandoned during the Second Quarter 2005 prior to remediation excavation activities at FS6A. LF6GW104, LF6GW105, and LFGW106 were installed during November 2005 in accordance with the RAP for FS6A and added to the FS6 well network during the Fourth Quarter 2005.

During the Third and Fourth Quarters 2005 groundwater monitoring events, depth to water was measured in LF6GW100, LF6GW101, LF6GW103, LF6GW104, LF6GW105, LF6GW106, and 231GW109. Depth to groundwater in the FS6 wells measured during the Fourth Quarter 2005 ranged from 7.25 feet bgs in LF6GW103 to 22.68 feet bgs in LF6GW105 (located in FS6B9). Groundwater elevations during the Fourth Quarter 2005 ranged from 11.16 feet above PLLW (in LF6GW103) to 19.29 feet above PLLW (in LF6GW105). The groundwater flow direction was generally towards the northeast towards San Francisco Bay following the general topographic slope and the groundwater gradient was estimated at approximately 0.013 feet per foot.

During the Fourth Quarter 2005, depth to groundwater in wells LF6GW100 (located at the east edge of the FS6 parking lot east of Building 1027) and LF6GW101 (located at the west edge of the FS6 parking lot) was measured at 12.78 and 11.80 feet bgs, respectively. Based on the depth to the bottom of fill measured in soil borings drilled in this parking lot as reported in the Main Installation RI Report (Dames & Moore 1997a), there is approximately 5 to almost 6 feet between the fill material and groundwater at this location.

Groundwater samples from FS6 wells have historically been analyzed for general chemistry, dissolved oxygen, TPHg, TPHd, TPHfo, PAHs, organochlorine pesticides (OCPs), PCBs, total dissolved solids (TDS), sulfide, arsenic speciation, total organic carbon (TOC), dissolved gases (ethane, ethene, and methane), and dissolved metals.

Samples collected from LF6GW104, LF6GW105 (located in FS6B9), and LF6GW106 during the Fourth Quarter 2005 were analyzed for dissolved oxygen, general chemistry parameters, dissolved metals, and TDS. The samples collected from LF6GW104 and LF6GW105 were also analyzed for PAHs, TPHD, and TPHfo. The only contaminants of concern detected in the sample collected from LF6GW105 were barium and chromium at concentrations below cleanup levels.

TPH has not exceeded RAP cleanup levels to date in any FS6 monitoring well samples (Treadwell & Rollo 2006, pending). No PCBs or PAHs were detected in any of the samples collected from FS6 wells during the Third and Fourth Quarters 2005. The laboratory detection limits are, however, greater than the cleanup levels for benzo(a)anthracene, benzo(b)fluoranthene, and chrysene. Aldrin, an OCP, was detected at 0.05 µg/L in the sample collected from LF6GW103 during the Third Quarter 2005. This was the first detection of Aldrin in a FS6 groundwater sample, and since it was not detected in the Fourth Quarter 2005 sample from this well, may be an anomaly.

Dissolved metals concentrations in the samples collected from LF6GW104 and LF6GW106 during Fourth Quarter 2005 are generally within the range of dissolved metals concentrations for other FS6 wells. No dissolved metals concentrations detected in FS6 wells sampled during Third and Fourth Quarter 2005 exceeded FS6A RAP-specified cleanup levels (Treadwell & Rollo 2004). Other dissolved metals that have exceeded their respective cleanup levels during past sampling events include:

- Thallium, detected for the first time in the sample collected from LF6GW100 at a concentration of 5 µg/L during the First Quarter 2005. It was not detected in any of the other samples collected from FS6 wells during this event. It was detected during the Fourth Quarter 2004 in the sample from LFGW102 at a concentration of 2.7 µg/L.

- Selenium, detected one time in LF6GW102 during July 2000, and believed to be an artifact of sampling.

- Zinc, detected during several rounds in LF6GW100 (six samples), LF6GW101 (four samples), and LF6GW103 (four samples); and once in LF6GW102. These elevated zinc detections occurred in 2001 and 2002 and were determined to be attributable to Clearwater Engineering filters (Treadwell & Rollo 2002). Since 2002, zinc has not been detected in FS6 wells above the FS6A RAP-specified cleanup levels.

The general chemistry parameters, TOC, dissolved gases, and arsenic speciation analyses for FS6 groundwater samples are used to evaluate the redox state of downgradient site conditions at the Building 1065 Area.

Based on the results of groundwater sample analyses, there are no discernable trends in the few analytes that have been detected in FS6 groundwater and thus it is unlikely that FS6 soils are a source of contamination to groundwater.

Building 1065/1027 Area

During the Fourth Quarter 2005, depth to groundwater was measured in 14 Building 1065/1027 Area shallow zone monitoring wells and piezometers. Depth to water ranged between 3.01 feet bgs in 1065PZ7A (located just east of Building 1029 in FS6B8A) and 10.50 feet bgs in 1065PZ6A (located south of Edie Road and Building 1047 in FS6B3). Groundwater elevations ranged between 7.46 feet above PPLW in 1065MW101 (located at the northwest corner of Building 1063 in FS6B8C) and 15.69 feet above PPLW in 1065PZ6A (located at the located south of Edie Road and Building 1047 in FS6B3).

Depth to groundwater was also measured in 10 Building 1065/1027 Area intermediate zone monitoring wells and piezometers during the Fourth Quarter 2005. Depth to water ranged between the surface in 1065MW9B (located between Buildings 1062 and 1063) and 10.74 feet bgs in 1065PZ6B (located south of Edie Road and Building 1047 in FS6B3). Groundwater elevations ranged between 12.13 feet above PPLW in 1065PZ1B (located on the north side of Building 1063) and 15.62 feet above PLLW in 1065PZ6B.

Groundwater samples were collected from 5 monitoring wells and 4 piezometers during the Third and Fourth Quarters 2005. Groundwater samples were analyzed for general chemistry parameters, TOC, dissolved gases, dissolved metals, arsenic speciation, TDS, dissolved oxygen, VOCs; benzene, toluene, ethylbenzene, and xylenes (BTEX), methyl-tert butyl ether (MTBE), total sulfides, TPHg, TPHd, TPHfo, and /or TPH as Stoddard solvent.

No VOCs, BTEX, or MTBE were detected in any of the samples collected from Building 1065/1027 area wells during the Third Quarter 2006. Total xylenes and carbon disulfide were detected in the sample collected from 1065MW101 at concentrations of 1 µg/L and 0.8 µg/L, respectively, during the Fourth Quarter 2005. The detected total xylene concentration is below the cleanup level of 1,750 µg/L for the Building 1065 Area and there is no Draft CAP-specified cleanup level for carbon disulfide. No other VOC, MTBE or BTEX compounds were detected during the Fourth Quarter 2005.

TPHg was only detected in the samples collected from 1065PZ1A (located north of Building 1063 and downgradient of the November 2003 interim removal action) during both the Third and Fourth Quarters 2005 at a concentration of 160 µg/L. This detection is within the historical TPHg concentration range for this well. TPHd was detected in the sample from 1065MW9A during the Fourth Quarter 2005 for the first time since the Fourth Quarter 2002. TPHfo was detected only in the sample from 1065PZ1B (for the

first time) during the Fourth Quarter 2005. No TPHg, TPHd, or TPHfo concentrations exceeded the Draft CAP-specified cleanup levels.

Dissolved arsenic was detected at concentrations exceeding its Draft CAP-specified cleanup level in five of the Building 1065 Area wells and piezometers sampled during the Third and/or Fourth Quarters 2005. Zinc was detected for the first time in the sample collected from 1065MW9B during the Third Quarter 2005 at a concentration of 85 µg/L. With the exception of arsenic, no other dissolved metals were detected above Draft CAP-specified cleanup levels for the Building 1065/1027 Area during both the Third and Fourth Quarters 2005.

Piezometers 1065PZ6A and 1065PZ6B are located in the northwest corner of the parking lot to the east of Building 1027, at the downgradient edge of FS6. These two piezometers have been sample in association with the Building 1065/1027 Area during 21 sampling events since September 1997. Total xylenes were detected one time in a sample collected from 1065PZ6A during 2002 at a concentration (0.78 µg/L) below Draft CAP cleanup levels. TPHd was detected twice and TPHfo detected once during 1999 at concentrations below Draft CAP cleanup levels in samples collected from 1065PZ6A. No VOCs or TPH have been detected in samples from 1065PZ6B. Dissolved chromium has been detected in three samples from 1065PZ6A and in two samples from 1065PZ6B at concentrations between 30 µg/L and 43 µg/L. Dissolved zinc was detected one time in a sample from 1065PZ6B. These detections of chromium and zinc did not exceed Draft CAP cleanup levels in groundwater.

Building 231/207 Area

Depth to groundwater in 16 Building 231/207 shallow zone groundwater monitoring wells and piezometers were measured during the Fourth Quarter 2005. Depth to groundwater ranged between 2.15 feet bgs in OW-1 (located to the west of Building 230) and 13.11 feet bgs in 231GW09 (located between Buildings 227 and 1029). Groundwater elevation ranged between 5.22 feet above PLLW in 231GW16 (located north of the Highway 101 Ramp and east of Halleck Street) and 11.17 feet above PLLW in 231GW09.

Depth to groundwater was also measured in 11 Building 231/207 intermediate zone groundwater monitoring wells during the Fourth Quarter 2005. Depth to groundwater ranged between 2.30 feet bgs in 231GW29 (located to the west of Building 230) and 10.47 feet bgs in 231GW27 (located in Halleck Street to the west of Building 231). Groundwater elevation ranged between 6.36 feet above PLLW in 207GW03 (located to the north of the Highway 101 Ramp) and 9.87 feet above PLLW in 231GW18 (located to the west of Building 201).

Depth to groundwater was measured in 3 Building 231/207 deep zone groundwater monitoring wells. Depth to groundwater ranged between 1.33 feet bgs in 231GW17

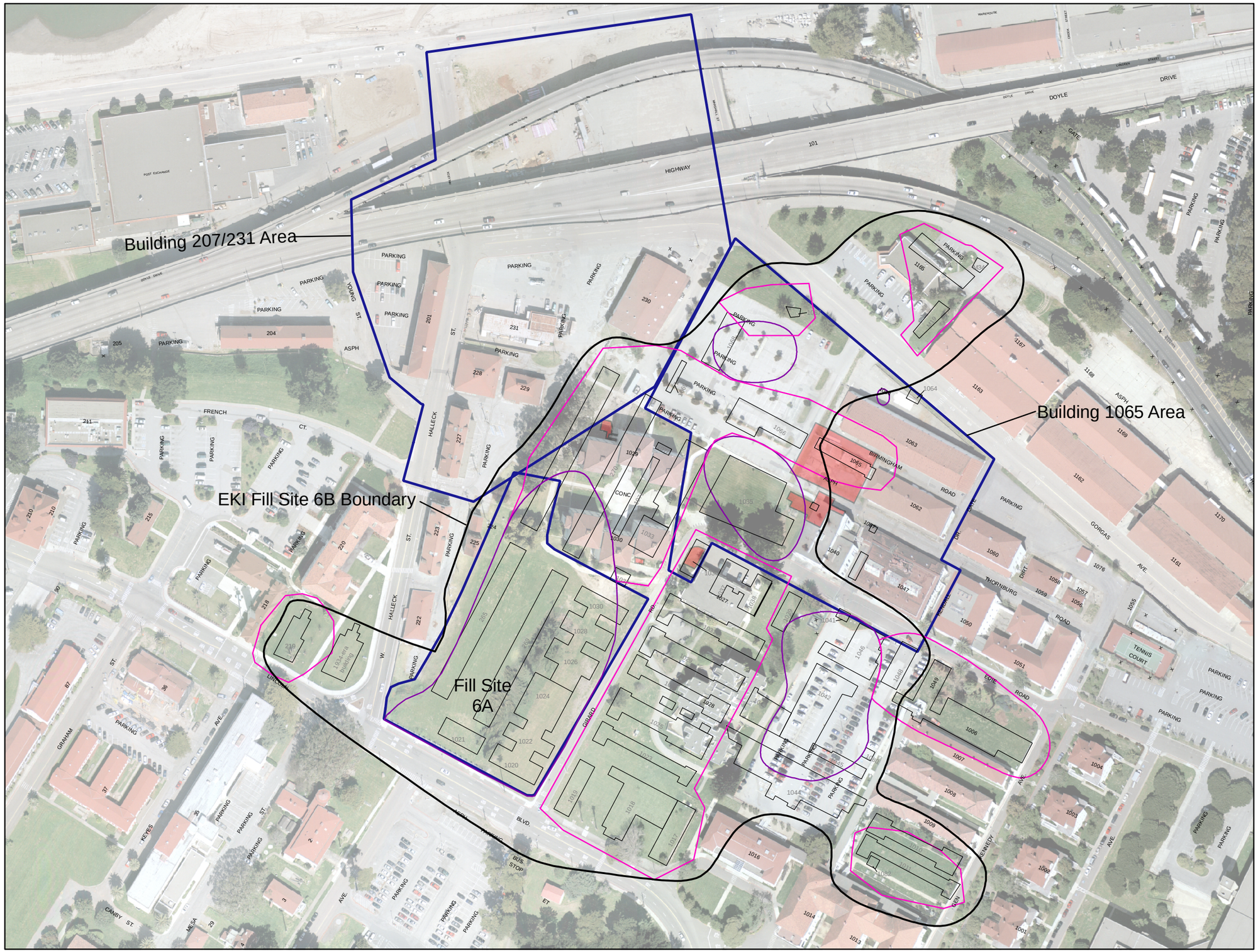
(located to the west of Building 201) and 2.70 feet bgs in 231GW13 (located north of the Highway 101 Ramp and east of Halleck Street). Groundwater elevation ranged between 11.00 in 231GW13 and 11.17 in 231GW16.

Only 231GW09 was sampled during the Third and Fourth Quarters 2005 as a downgradient FS6A well (see Fill Site 6A above).

Groundwater samples collected from 231GW09 and other Building 231/207 groundwater monitoring wells during previous sampling rounds have been analyzed for general chemistry, TOC, dissolved gases, dissolved metals, arsenic speciation, TDS, dissolved oxygen, VOCs, MTBE, total sulfites; TPHg, TPHd and TPHfo, TPHg, TPHd, TPHfo, BTEX, 1,2-dichloroethane, naphthalene, dissolved arsenic, copper, lead, and nickel have been detected at concentrations exceeding their respective Draft CAP-specified cleanup levels in at least one sample collected from a Building 231/207 well during past sampling events.

Summary of Groundwater Conditions within FS6B

Results of sampling of Presidio wells at FS6, the Building 1065/1027 Area, and the Building 231/207 Area indicate that fill materials have not impacted groundwater. Rather contaminants detected in samples collected from groundwater monitoring wells at these sites indicate that groundwater has been affected by past practices and processes related to petroleum products within these areas. Therefore, no additional characterization of groundwater in the FS6B area is necessary.



0 75 150 300

Approximate Feet

Legend

- EKI (2003, Fig. 6-1) Fill Site 6B Boundary
- EKI Area Identified as Possible Fill Site
- EKI (2003, Fig. 6-1) Area Suspected as Possible Fill Site
- Footprint of Demolished Buildings With Building Numbers
- Boundary of Other Remedial or Corrective Action Plan Area
- Previously Excavated Areas

Notes:

1. All locations are approximate.
2. Basemap was provided by the Presidio Trust.

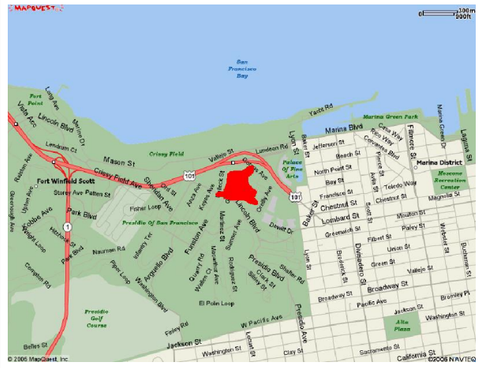
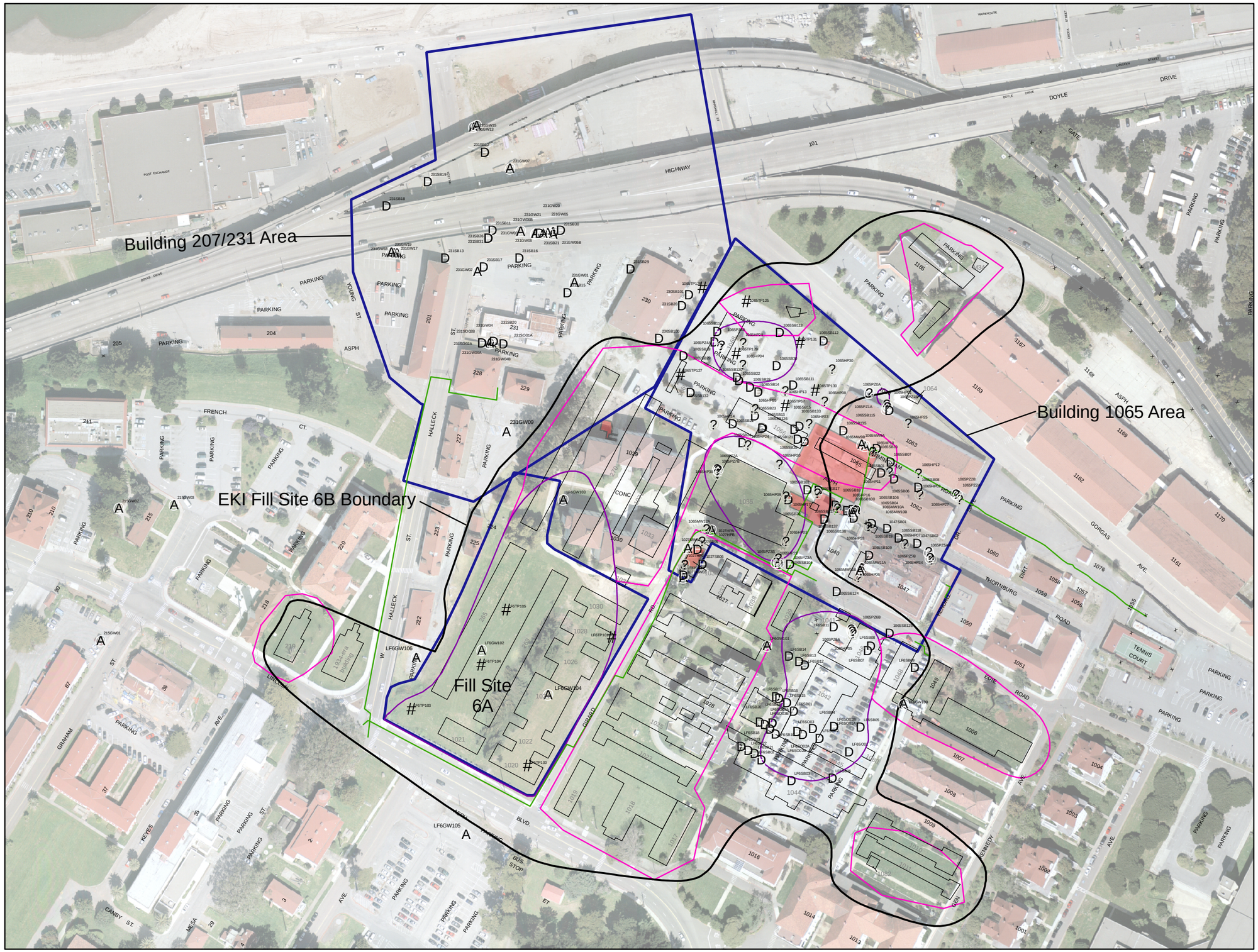


Figure 2-1
Previous Delineation of
Fill Site 6
Presidio of San Francisco, CA

A



0 75 150 300

Approximate Feet

Legend

- EKI (2003, Fig. 6-1) Fill Site 6B Boundary
- EKI Area Identified as Possible Fill Site
- EKI (2003, Fig. 6-1) Area Suspected as Possible Fill Site
- Approximate Location of Former Fuel Distribution System Pipeline in Vicinity of Fill Site 6
- Footprint of Demolished Buildings With Building Numbers
- Boundary of Other Remedial or Corrective Action Plan Area
- Previously Excavated Areas
- ? Hydropunch
- A Monitoring Well
- ? Piezometer
- D Soil Boring
- # Test Pit

Notes:

1. All locations are approximate.
2. Basemap was provided by the Presidio Trust.
3. EKI 2003. Revised FS Report Main Installation Sites, March.
4. Not all of the excavations and sampling locations outside of the boundary of Fill Site 6 are shown on this figure.
5. Excavation confirmation samples collected from Fill Site 6A are not shown.
6. Locations of monitoring wells LF6GW104, 105, and 106 are approximate.

Figure 2-2
Sampling Locations
to Date at Fill Site 6B
Presidio of San Francisco, CA

A

0 75 150 300

Approximate Feet

Legend

- Footprint of Demolished Buildings With Building Numbers
- Boundaries of Other Remedial or Corrective Action Plan Area
- Previously Excavated Areas
- Buffer Zone Ecological Cleanup Level
- Special Status Ecological Cleanup Level
- Proposed Fill Site 6B Boundary
- Further Subdivision of 6B8
- Freshwater Ecological Protection Zone
- Approximate Boundary of Building 1065 Corrective Action Plan Area Remedial Unit "B"

Notes:

1. All locations are approximate.
2. Basemap was provided by the Presidio Trust.

Figure 2-3
Proposed Re-Definition
of Fill Site 6B for Site
Characterization
Presidio of San Francisco, CA

A

Figure 2-4
Sampling Locations
to Date and Proposed
Sub-Areas at Fill Site 6B
Presidio of San Francisco, CA

A

Section 3
Data Quality Objectives

This section presents the DQOs for the sampling approach at FS6B. DQOs for sampling at FS6B have been developed in accordance with the DQO process outlined in *Guidance for the Data Quality Objectives Process* (U.S. EPA 2000). The DQO process is a series of seven planning steps based on the scientific method, designed to specify the type, quantity, and quality of environmental data needed to support defensible decisions based on current conditions and proposed activities at an environmental site (U.S. EPA 2000).

The seven steps of the DQO process are as follows:

- Step 1: State the problem to be addressed
- Step 2: Identify the decisions that will address the problem
- Step 3: Identify the inputs and criteria affecting each decision
- Step 4: Specify the boundaries of the study
- Step 5: Develop decision rules
- Step 6: Specify tolerances on decision errors, and
- Step 7: Optimize the design for obtaining data.

DQOs are qualitative and quantitative statements derived from the outputs of each step of the DQO process that:

- Clarify study objectives;
- Define data needs (type, quality, etc.); and
- Specify acceptable levels of decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the decision.

The derived statements are then used to develop scientific, resource-effective, and defensible sampling designs. The DQO summaries for each of the subareas of FS6B to be investigated are provided as Tables 3-1 through 3-8.

Table 3-1. Data Quality Objectives, Fill Site 6B1 Area (Former Buildings 1010, 1011, and 1082), Presidio of San Francisco

State the Problem	Identify the Decisions	Identify Inputs to the Decisions	Define The Study Boundaries	Develop Decision Rules	Specify Limits on Decision Errors	Optimize the Design
DQO 1: The presence of contaminants related to past use of Buildings 1010, 1011, and 1082 has not been evaluated. Buildings 1010 and 1011 were constructed in 1931 and 1917, respectively and demolished after 1975. Data for other demolished buildings in FS6B area show building debris, lead, and other COCs in soils.	DQO 1: Is there residual contamination present from building demolition that exceeds cleanup levels?	DQO 1: – Past site uses could have involved lead-based paints. – No known history for USTs, petroleum products, or solvents; however TPH have been detected in soil at FS6A and at the FDS lines. – Soil data for building demolition sites for the FS6B area show metals (lead) as the primary COC, with occasional detections of PCBs, PAHs, and pesticides. – Soil samples to be collected for metals, PCBs, pesticides, PAHs, and TPHg/d/fo analyses at the FS6B1 Area – Residential and drinking water standard cleanup levels and background concentrations for soil.	DQO 1: Soil samples to top of native material within the footprint of FS6B1 Buildings.	DQO 1: If chemical concentrations are below proposed cleanup levels, the potential for unacceptable risk is low and no further evaluation is necessary. If chemical concentrations exceed cleanup levels (in at least one sample), no additional samples will be collected but remedial actions will be based on those chemical concentrations that exceed cleanup levels.	DQO 1: A potential error in analysis of soil would be to incorrectly quantify the chemicals present in soil. The acceptable range of decision error would be a consequence of field and/or analytical errors and will be evaluated during the data validation procedures. Field, analytical, and data validation procedures will be performed in accordance with the FS6B Work Plan and Presidio SAP/QAPP. A potential error in the design of the soil analytical program would be to bias samples such that chemical concentrations are under-estimated. The acceptable range of decision error would be a consequence of sampling design errors that will be evaluated by comparing analytical results with those found at other locations within the FS6B Area. The use of qualified staff in collecting samples at locations and depths where contamination is visually observed will reduce the potential for this error. The number of samples could also contribute to the error.	DQO 1: LF6SB200, -201, -202, -203, -204, -205 – 6 soil borings – 3 soil samples from each boring, 0 to 6 inches, at bottom of fill material and from top of native material. – Analyses: Metals, PAHs, PCBs, pesticides, and TPHg/d/fo. – Meets DQO 1: To determine if residual contamination is present in soil at the site.

COC	contaminant of concern
DQO	data quality objective
FS6A	Fill Site 6A
FS6B	Fill Site 6B
ft bgs	feet below ground surface
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
QAPP	Quality Assurance Project Plan
SAP	Sampling and Analysis Plan
TPHg/d/fo	total petroleum hydrocarbons as gas, diesel, and fuel oil
UST	underground storage tank

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Table 3-2. Data Quality Objectives, Fill Site 6B2 Area (Former Buildings 1006 and 1049), Presidio of San Francisco

State the Problem	Identify the Decisions	Identify Inputs to the Decisions	Define The Study Boundaries	Develop Decision Rules	Specify Limits on Decision Errors	Optimize the Design
DQO 1: The presence of contaminants related to past use of Buildings 1006 and 1049 has not been evaluated. The buildings were constructed in 1906 and 1917, respectively and demolished after 1975. Data for other demolished buildings in FS6B area show building debris, lead, and other COCs in soils.	DQO 1: Is there residual contamination present from building demolition that exceeds cleanup levels?	DQO 1: – Past site uses could have involved lead-based paints. – No known history for USTs, petroleum products, or solvents; however TPH have been detected in soil at FS6A and at the FDS lines. – Soil data for building demolition sites for the FS6B area show metals (lead) as the primary COC, with occasional detections of PCBs, PAHs, and pesticides. – Soil samples to be collected for metals, PCBs, pesticides, PAHs, and TPHg/d/fo analyses at the FS6B2 Area. – Residential and drinking water standard cleanup levels and background concentrations for soil.	DQO 1: Soil samples to top of native material within the footprint of FS6B2 Buildings.	DQO 1: If chemical concentrations are below proposed cleanup levels, the potential for unacceptable risk is low and no further evaluation is necessary. If chemical concentrations exceed cleanup levels (in at least one sample), no additional samples will be collected but remedial actions will be based on those chemical concentrations that exceed cleanup levels.	DQO 1: A potential error in analysis of soil would be to incorrectly quantify the chemicals present in soil. The acceptable range of decision error would be a consequence of field and/or analytical errors and will be evaluated during the data validation procedures. Field, analytical, and data validation procedures will be performed in accordance with the FS6B Work Plan and Presidio SAP/QAPP. A potential error in the design of the soil analytical program would be to bias samples such that chemical concentrations are under-estimated. The acceptable range of decision error would be a consequence of sampling design error that will be evaluated by comparing analytical results with those found at other locations within the FS6B Area. The use of qualified staff in collecting samples at locations and depths where contamination is visually observed will reduce the potential for this error. The number of samples could also contribute to the error.	DQO 1: LF6TP206, -207, -208, -209, -210, -211 – 6 approximately 10-ft long trenches, as site conditions allow. – 3 soil samples from each trench, 0 to 6 inches, at bottom of fill material, and top of native material. – Analyses: Metals, PAHs, PCBs, pesticides, and TPHg/d/fo. – Meets DQO 1: To determine if residual contamination is present in soil at the site.

COC	contaminant of concern
DQO	data quality objective
FS6A	Fill Site 6A
FS6B	Fill Site 6B
ft bgs	feet below ground surface
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
QAPP	Quality Assurance Project Plan
SAP	Sampling and Analysis Plan
TPHg/d/fo	total petroleum hydrocarbons as gas, diesel, and fuel oil
UST	underground storage tank

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Table 3-3. Data Quality Objectives, Fill Site 6B4 Area (Existing Buildings 1027 and 1028)[1], Presidio of San Francisco

State the Problem	Identify the Decisions	Identify Inputs to the Decisions	Define The Study Boundaries	Develop Decision Rules	Specify Limits on Decision Errors	Optimize the Design
DQO 1: The presence of contaminants related to past use of Buildings in FS6B4 area has not been evaluated. The buildings were constructed prior to 1920 and demolished 1974 and later. Data for other demolished buildings in FS6B area show building debris, lead and other COCs in soils.	DQO 1: Is there residual contamination present from building demolition that exceeds cleanup levels?	DQO 1: – Past site uses could have involved lead-based paints. – Soil data for building demolition sites for the FS6B area show metals (lead) as the primary COC, with occasional detections of PCBs, PAHs, and pesticides. – No known history for USTs, petroleum products, or solvents; however TPH have been detected in soil at FS6A and at some locations along the former FDS lines. FDS lines ran along north and west boundary of FS6B4. – Soil samples to be collected for metals, PCBs, pesticides, PAHs, and TPHg/d/fo analyses at the FS6B4 Area – Residential, special status ecological, and drinking water standard cleanup levels and background concentrations for soil.	DQO 1: Soil samples to top of native material within the footprint of FS6B4 Buildings.	DQO 1: If chemical concentrations are below proposed cleanup levels, the potential for unacceptable risk is low and no further evaluation is necessary. If chemical concentrations exceed cleanup levels (in at least one sample), no additional samples will be collected but remedial actions will be based on those chemical concentrations that exceed cleanup levels.	DQO 1: A potential error in analysis of soil would be to incorrectly quantify the chemicals present in soil. The acceptable range of decision error would be a consequence of field and/or analytical errors and will be evaluated during the data validation procedures. Field, analytical, and data validation procedures will be performed in accordance with the FS6B Work Plan and Presidio SAP/QAPP. A potential error in the design of the soil analytical program would be to bias samples such that chemical concentrations are under-estimated. The acceptable range of decision error would be a consequence of sampling design error that will be evaluated by comparing analytical results with those found at other locations within the FS6B Area. The use of qualified staff in collecting samples at locations and depths where contamination is visually observed will reduce the potential for this error. The number of samples could also contribute to the error.	DQO 1: LF6SB212, -213; and LF6TP214, -215, -216, -217, -218, -219, -220 – 2 soil borings and 7 approximately 10-ft long trenches (as site conditions permit). – 3 soil samples from each boring and trench, 0 to 6 inches, at bottom of fill material, and top of native material. – Analyses: Metals, PAHs, PCBs, pesticides, and TPHg/d/fo. – Meets DQO 1: To determine if residual contamination is present in soil at the site.

[1] Former Buildings 1017, 1018, 1019, 1023, 1025, 1027, 1029, 1031, 1036, 1037, 1038, 1039

COC	contaminant of concern
DQO	data quality objective
FS6A	Fill Site 6A
FS6B	Fill Site 6B
ft bgs	feet below ground surface
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
QAPP	Quality Assurance Project Plan
SAP	Sampling and Analysis Plan
TPHg/d/fo	total petroleum hydrocarbons as gas, diesel, and fuel oil
UST	underground storage tank

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Approved_____

Table 3-4. Data Quality Objectives, Fill Site 6B5 Area (Existing Buildings 1029 and 1030)[1], Presidio of San Francisco

State the Problem	Identify the Decisions	Identify Inputs to the Decisions	Define The Study Boundaries	Develop Decision Rules	Specify Limits on Decision Errors	Optimize the Design
DQO 1: The presence of contaminants related to past use of building in the FS6B5 area has not been evaluated. These building date to as early as 1903 and were demolished in the mid-1980s. Data for other demolished buildings in FS6B area show building debris, lead and other COCs in soils.	DQO 1: Is there residual contamination present from building demolition that exceeds cleanup levels?	DQO 1: – Past site uses could have involved lead-based paints. – Soil data for building demolition sites for the FS6B area show metals (lead) as the primary COC, with occasional detections of PCBs, PAHs, and pesticides. – A 650 gallon fuel oil UST was removed from both existing Buildings 1029 and 1030 in July 1996. Residual contamination addressed by basewide CAP – Soil samples to be collected for metals, PCBs, pesticides, PAHs, and TPHg/d/fo analyses at the FS6B5 Area – Residential, freshwater ecological protection zone, special status and buffer zone ecological, and drinking water standard cleanup levels and background concentrations for soil.	DQO 1: Soil samples to top of native material in open areas adjacent to Buildings 1029/1030.	DQO 1: If chemical concentrations are below proposed cleanup levels, the potential for unacceptable risk is low and no further evaluation is necessary. If chemical concentrations exceed cleanup levels (in at least one sample), no additional samples will be collected but remedial actions will be based on those chemical concentrations that exceed cleanup levels.	DQO 1: A potential error in analysis of soil would be to incorrectly quantify the chemicals present in soil. The acceptable range of decision error would be a consequence of field and/or analytical errors and will be evaluated during the data validation procedures. Field, analytical, and data validation procedures will be performed in accordance with the FS6B Work Plan and Presidio SAP/QAPP. A potential error in the design of the soil analytical program would be to bias samples such that chemical concentrations are under-estimated. The acceptable range of decision error would be a consequence of sampling design error that will be evaluated by comparing analytical results with those found at other locations within the FS6B Area. The use of qualified staff in collecting samples at locations and depths where contamination is visually observed will reduce the potential for this error. The number of samples could also contribute to the error.	DQO 1: LF6SB221, -222, -223, -224, -225, -226 – 6 soil borings – 3 soil samples from each boring, 0 to 6 inches, at bottom of fill material, and top of native material. – Analyses: Metals, PAHs, PCBs, pesticides, and TPHg/d/fo. BTEX for samples from LF6B222 only (to meet DQO 2 for RU-B located in FS6B8. See Table 3-7.).. – Meets DQO 1: To determine if residual contamination is present in soil at the site.

[1] Former Buildings 266, 270, 1032, 1033, 1034, 1070, 1071

CAP	Corrective Action Program
COC	contaminant of concern
DQO	data quality objective
FS6A	Fill Site 6A
FS6B	Fill Site 6B
ft bgs	feet below ground surface
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
QAPP	Quality Assurance Project Plan
SAP	Sampling and Analysis Plan
TPHg/d/fo	total petroleum hydrocarbons as gas, diesel, and fuel oil
UST	underground storage tank

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Approved_____

Table 3-5. Data Quality Objectives, Fill Site 6B6 Area (Former Building 219 and 1934 era Building), Presidio of San Francisco

State the Problem	Identify the Decisions	Identify Inputs to the Decisions	Define The Study Boundaries	Develop Decision Rules	Specify Limits on Decision Errors	Optimize the Design
DQO 1: The presence of contaminants related to past use of Building 219 and an unidentified 1934-era building has not been evaluated. According to the Quartermaster Report, Building 291 (former Building 181) was the Post Quartermaster C.A. Air and C.W.S office (chemical warfare). The building was constructed in 1899. Data for other demolished buildings in FS6B area show building debris, lead and other COCs in soils.	DQO 1: Is there residual contamination present from building demolition that exceeds cleanup levels?	DQO 1: – Past site uses could have involved lead-based paints. – Soil data for building demolition sites for the FS6B area show metals (lead) as the primary COC, with occasional detections of PCBs, PAHs, and pesticides. – No known history for USTs, petroleum products, or solvents; however TPH have been detected in soil at FS6A and at the FDS lines. – Soil samples to be collected for metals, PCBs, pesticides, PAHs, and TPHg/d/fo analyses at the FS6B6 Area – Residential and drinking water standard cleanup levels and background concentrations for soil.	DQO 1: Soil samples to top of native material within the footprint of Building 219 and 1934-era Building.	DQO 1: If chemical concentrations are below proposed cleanup levels, the potential for unacceptable risk is low and no further evaluation is necessary. If chemical concentrations exceed cleanup levels (in at least one sample), no additional samples will be collected but remedial actions will be based on those chemical concentrations that exceed cleanup levels.	DQO 1: A potential error in analysis of soil would be to incorrectly quantify the chemicals present in soil. The acceptable range of decision error would be a consequence of field and/or analytical errors and will be evaluated during the data validation procedures. Field, analytical, and data validation procedures will be performed in accordance with the FS6B Work Plan and Presidio SAP/QAPP. A potential error in the design of the soil analytical program would be to bias samples such that chemical concentrations are under-estimated. The acceptable range of decision error would be a consequence of sampling design error that will be evaluated by comparing analytical results with those found at other locations within the FS6B Area. The use of qualified staff in collecting samples at locations and depths where contamination is visually observed will reduce the potential for this error. The number of samples could also contribute to the error.	DQO 1: LF6TP227, -228, -229 – 3 approximately 10-ft long trenches as site conditions allow. – 3 soil samples from each trench, 0 to 6 inches, at bottom of fill material, and top of native material. – Analyses: Metals, PAHs, PCBs, pesticides, and TPHg/d/fo. – Meets DQO 1: To determine if residual contamination is present in soil at the site.

COC	contaminant of concern
DQO	data quality objective
FS6A	Fill Site 6A
FS6B	Fill Site 6B
ft bgs	feet below ground surface
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
QAPP	Quality Assurance Project Plan
SAP	Sampling and Analysis Plan
TPHg/d/fo	total petroleum hydrocarbons as gas, diesel, and fuel oil
UST	underground storage tank

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Table 3-6. Data Quality Objectives, Fill Site 6B7 Area (Former Buildings M19, M28, and M34 at Existing Building 1165 Location), Presidio of San Francisco

• State the Problem	• Identify the Decisions	Identify Inputs to the Decisions	Define The Study Boundaries	Develop Decision Rules	Specify Limits on Decision Errors	Optimize the Design
DQO 1: The presence of contaminants related to past use of Buildings M19/M28 /M34 has not been evaluated. Construction and demolition details are not known. Buildings demolished after 1974. Building locations now partially covered by Building 1165. Data for other demolished buildings in FS6B area show building debris, lead and other COCs in soils.	DQO 1: Is there residual contamination present from building demolition that exceeds cleanup levels?	DQO 1: – Past site uses could have involved lead-based paints. – Soil data for building demolition sites for the FS6B area show metals (lead) as the primary COC, with occasional detections of PCBs, PAHs, and pesticides. – No known history for USTs, petroleum products, or solvents; however TPH have been detected in soil at FS6A and at the FDS lines. – Soil samples to be collected for metals, PCBs, pesticides, PAHs, and TPHg/d/fo analyses at the FS6B7 Area. – Residential, buffer zone ecological, and drinking water standard cleanup levels and background concentrations for soil.	DQO 1: Soil samples to top of native material with in the footprint area of former FS6B7 Buildings.	DQO 1: If chemical concentrations are below proposed cleanup levels, the potential for unacceptable risk is low and no further evaluation is necessary. If chemical concentrations exceed cleanup levels (in at least one sample), no additional samples will be collected but remedial actions will be based on those chemical concentrations that exceed cleanup levels.	DQO 1: A potential error in analysis of soil would be to incorrectly quantify the chemicals present in soil. The acceptable range of decision error would be a consequence of field and/or analytical errors and will be evaluated during the data validation procedures. Field, analytical, and data validation procedures will be performed in accordance with the FS6B Work Plan and Presidio SAP/QAPP. A potential error in the design of the soil analytical program would be to bias samples such that chemical concentrations are under-estimated. The acceptable range of decision error would be a consequence of sampling design error that will be evaluated by comparing analytical results with those found at other locations within the FS6B Area. The use of qualified staff in collecting samples at locations and depths where contamination is visually observed will reduce the potential for this error. The number of samples could also contribute to the error.	DQO 1: LF6SB230, -231, -232, -233 – 4 soil borings – 3 soil samples from each boring, 0 to 6 inches, at bottom of fill material, and top of native material. – Analyses: Metals, PAHs, PCBs, pesticides, and TPHg/d/fo. – Meets DQO 1: To determine if residual contamination is present in soil at the site.

COC	contaminant of concern
DQO	data quality objective
FS6A	Fill Site 6A
FS6B	Fill Site 6B
ft bgs	feet below ground surface
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
QAPP	Quality Assurance Project Plan
SAP	Sampling and Analysis Plan
TPHg/d/fo	total petroleum hydrocarbons as gas, diesel, and fuel oil
UST	underground storage tank

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Table 3-7. Data Quality Objectives, Fill Site 6B8A and 6B8C Areas (Former Buildings 1035 and 1067), Presidio of San Francisco

State the Problem	Identify the Decisions	Identify Inputs to the Decisions	Define The Study Boundaries	Develop Decision Rules	Specify Limits on Decision Errors	Optimize the Design
DQO 1. The presence of contaminants in FS6B8A and FS6B8C subareas as related to past use of Buildings has not been evaluated. Building 1035 within FS6B8A was constructed in 1903 and an addition added in 1941. It was demolished in 1975. Building 1067 within FS6B8C was constructed circa 1910 and demolished in 1975. Data for other demolished buildings in FS6B area show building debris, lead, and other COCs in soils. DQO 2. Soil Remedial Unit "B" (RU-B) was identified in the *Draft Corrective Action Plan, Building 1065 Area* (MACTEC 2005) located in the area of the parking lot to the west of Building 1063. The majority of RU-B is located within FS6B8B. The Trust had proposed a recommended corrective action alternative for RU-B of capping; however, because the northern and southern extent of RU-B were not defined, the California Regional Water Quality Control Board requested that delineation of RU-B be completed during additional site characterization of FS6B.	DQO 1: Is there residual contamination present from building demolition that exceeds cleanup levels? DQO 2: Are the northern and southern boundaries of RU-B in the Building 1065 CAP Area defined?	DQO 1: – Past site uses could have involved lead-based paints. – Soil data for building demolition sites for the FS6B area show metals (lead) as the primary COC, with occasional detections of PCBs, PAHs, and pesticides. – No known history for USTs, petroleum products, or solvents; however TPH have been detected in soil at FS6A and at the FDS lines. FS6B8 is adjacent to Building 1065 Corrective Action Plan Area. – Soil samples to be collected for metals, PCBs, pesticide, PAH, and TPHg/d/fo analyses at the FS6B8A and FS6B8C7 Area. – Residential, freshwater ecological protection zone, buffer zone ecological, and drinking water standard cleanup levels and background concentrations for soil. DQO 2: – Soil data for RU-B indicate that TPHd, TPHfo, benzene, benzo(a)pyrene, cadmium, lead, and zinc were detected in unsaturated and saturated zone soils between 2 and 7.3 feet bgs at concentrations exceeding cleanup levels..	DQOs 1 and 2: Soil samples to within native material in the footprint and immediate vicinity of former FS6B8a and FS6B8c Buildings.	DQO 1: If chemical concentrations are below proposed cleanup levels, the potential for unacceptable risk is low and no further evaluation is necessary. If chemical concentrations exceed cleanup levels (in at least one sample), no additional samples will be collected but remedial actions will be based on those chemical concentrations that exceed cleanup levels. DQO 2: If lateral and vertical extent of TPHd, TPHfo, benzene, benzo(a)pyrene, cadmium, lead, and zinc in soil are defined, then evaluation and selection of a remedial alternative for RU-B will be addressed in the FS6B Remedial Action Plan.	DQO 1: A potential error in analysis of soil would be to incorrectly quantify the chemicals present in soil. The acceptable range of decision error would be a consequence of field and/or analytical errors and will be evaluated during the data validation procedures. Field, analytical, and data validation procedures will be performed in accordance with the FS6B Work Plan and Presidio SAP/QAPP. A potential error in the design of the soil analytical program would be to bias samples such that chemical concentrations are under-estimated. The acceptable range of decision error would be a consequence of sampling design error that will be evaluated by comparing analytical results with those found at other locations within the FS6B Area. The use of qualified staff in collecting samples at locations and depths where contamination is visually observed will reduce the potential for this error. The number of samples could also contribute to the error.	DQOs 1 and 2: LF6TP234 and -236, and LF6SB235 and -237 – One approximately 10-ft long trench in 6B8A (as site conditions permit); – 2 approximately 10-ft long trenches and one soil boring at 6B8C. – 3 soil samples from each trench and boring, from 0 to 6 inches, at bottom of fill material, and at top of native material. – Analyses: Metals, PAHs, PCBs, pesticides, and TPHg/d/fo. BTEX also for samples collected from LF6SB235 and LF6TP236 and -237 in FS6B8C – Meets DQO 1: To determine if residual contamination is present in soil at the site. – Meets DQO 2: To define the lateral extent of contamination at RU-B.

COC	contaminant of concern
DQO	data quality objective
FS6A	Fill Site 6A
FS6B	Fill Site 6B
ft bgs	feet below ground surface
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
QAPP	Quality Assurance Project Plan
SAP	Sampling and Analysis Plan
TPHg/d/fo	total petroleum hydrocarbons as gas, diesel, and fuel oil
USTs	underground storage tanks

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Table 3-8. Data Quality Objectives, Fill Site 6B9 Area (YMCA, Building 63 Parking Lot), Presidio of San Francisco

State the Problem	Identify the Decisions	Identify Inputs to the Decisions	Define The Study Boundaries	Develop Decision Rules	Specify Limits on Decision Errors	Optimize the Design
DQO 1: The presence of contaminants related to past use of the parking lot at the southeast corner of Lincoln Blvd. and Funston Avenue has not been fully evaluated. Based on review of historical maps and aerial photographs, there has never been a building at this location; however, it is also evident that the area has had imported fill brought in (circa 1950's) from other, presumably, on-base locations.	DQO 1: Is there residual contamination present in fill materials placed at this location that may have contained contaminants exceeding Presidio clean-up levels?	DQO 1: – No known history for USTs, petroleum products, or solvents; however metals exceeding cleanup levels have been detected in soil samples collected from a boring for a monitoring well installed at this site. – Analytical results for soil samples collected from the boring drilled for groundwater monitoring well LF6GW105 indicate that metals (arsenic, chromium, lead, mercury, and zinc) exceed cleanup levels. – Soil samples to be collected for metals, PCBs, pesticides, PAHs, and TPHg/d/fo analyses at the FS6B9 Area. – Residential, freshwater ecological protection zone, buffer zone ecological, and drinking water standard cleanup levels and background concentrations for soil.	DQO 1: Soil samples to top of native material within and immediately adjacent to the YMCA parking lot.	DQO 1: If chemical concentrations are below proposed cleanup levels, the potential for unacceptable risk is low and no further evaluation is necessary. If chemical concentrations exceed cleanup levels (in at least one sample), no additional samples will be collected but remedial actions will be based on those chemical concentrations that exceed cleanup levels.	DQO 1: A potential error in analysis of soil would be to incorrectly quantify the chemicals present in soil. The acceptable range of decision error would be a consequence of field and/or analytical errors and will be evaluated during the data validation procedures. Field, analytical, and data validation procedures will be performed in accordance with the FS6B Work Plan and Presidio SAP/QAPP. A potential error in the design of the soil analytical program would be to bias samples such that chemical concentrations are under-estimated. The acceptable range of decision error would be a consequence of sampling design errors that will be evaluated by comparing analytical results with those found at other locations within the FS6B Area. The use of qualified staff in collecting samples at locations and depths where contamination is visually observed will reduce the potential for this error. The number of samples could also contribute to the error.	DQO 1: LF6SB238 and-239 and LF6BTP 240, 241, 242, 243, and 244 . – 2 soil borings and five trenches – 3 soil samples from each soil boring and trench, 0 to 6 inches, at bottom of fill material and from top of native material. – Analyses: Metals, PAHs, PCBs, pesticides, and TPHg/d/fo. – Meets DQO 1: To determine if residual contamination is present in soil at the site.

COC	contaminant of concern
DQO	data quality objective
FS6A	Fill Site 6A
FS6B	Fill Site 6B
ft bgs	feet below ground surface
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
QAPP	Quality Assurance Project Plan
SAP	Sampling and Analysis Plan
TPHg/d/fo	total petroleum hydrocarbons as gas, diesel, and fuel oil
UST	underground storage tank

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Section 4 Field Investigation Approach

This section presents the proposed sampling investigation approach for FS6B. The methods and procedures to be used during this investigation are presented in Section 5.

4.1 Sampling Approach

Based on the proposed redefinition of FS6B as discussed in Section 2.2, the Trust proposes to perform soil sampling at FS6B subareas 6B1, 6B2, 6B4, 6B5, 6B6, 6B7, 6B8A, 6B8C, and 6B9 to characterize the site for future remedy determination in RAP5. No additional sampling is proposed for subareas FS6B3 or FS6B8B.

Sampling is proposed within these nine subareas to determine if contaminants related to building debris are present in soil. Therefore, sampling will be focused on locations within or immediately adjacent to footprints of the former buildings at all locations except 6B9. Sampling at 6B9 will be focused within the area shown as "likely extent of fill" on Figure 4-7. Proposed sampling locations at each of the nine areas are shown on Figures 4-1 through 4-7. Soil samples will be analyzed for Title 22 metals, PAHs, PCBs, pesticides, and total petroleum hydrocarbons as gasoline, diesel, and fuel oil (TPHg/d/fo). A summary of the proposed sampling approach is presented in Table 4-1.

The preferred method of sampling is through the use of test pits dug by a backhoe. However, existing uses at some subareas may not be amenable to backhoe exploration and a small soil probe rig may be used. In those areas that are currently vacant and not covered by concrete (such as subareas 6B2 and portions of 6B4, 6B6, 6B8A and 6B8C, and 6B9), test pits will be dug. For locations that are frequently used, such as the FS6B1 courtyard and in the vicinity of Buildings 1029/1030 housing, a small soil sampling rig will be used.

Soil samples are proposed for collection from each test pit and soil boring from within 6 inches of the surface and from an interval of obvious fill debris (approximated to be at a depth of approximately 4.5 to 7 feet bgs within the subareas north of Lincoln Blvd., and between 12 feet and 20 feet bgs in the YMCA parking lot [subarea FS6B9]). A sample of native material will also be collected from each soil boring and test pit. Test pits are anticipated to be approximately 7 to 8 feet in depth in the areas of FS6B north of Lincoln Boulevard and no deeper than 15 feet bgs in FS6B9. If native soil is not encountered at a depth of 15 feet in FS6B9 then soil borings will need to be drilled at this location in order to collect samples of native material. The 6 inch sample and the fill sample from each sampling location will be analyzed and the laboratory instructed to hold all samples collected from the native material. If any contaminants are detected at

concentrations exceeding respective screening levels, the laboratory will be instructed to analyze the corresponding sample collected from the native material.

For health and safety reasons, none of the trenches will be entered if they are deeper than 4 to 5 deep. If shallow groundwater is encountered in a trench prior to reaching native material, the trench will be terminated at that depth.

4.2 Screening Levels

For site characterization purposes, screening levels will be used. The screening levels will be the most stringent applicable cleanup levels for FS6B, as well as background screening levels for metals. Cleanup levels for petroleum hydrocarbons and related constituents are determined by the Site Cleanup Requirements (SCRs) as adopted in California Regional Water Quality Control Board San Francisco Bay Region (CRWQCB) Order R2-2003-0080 (CRWQCB 2003). Cleanup levels for non-petroleum contaminants are based on the planned land use and site lithology as presented in the Cleanup Levels Document (EKI 2002).

The key factors that are used to develop cleanup levels for a given site are human health and ecological exposure, as well as background metal concentrations. Cleanup levels are defined by the most sensitive population that is reasonably associated with the planned land use identified for a particular area (EKI 2002). As described in the Cleanup Levels Document, background metals concentrations are based on the predominant soil lithologies found in the Presidio. For any given site, the applicable cleanup level incorporates the impacted media, predominant soil or sediment lithologies and associated background metal concentrations, planned human land use (residential, recreational, or commercial/industrial), planned ecological land use (including the presence of special-status species), the presence of petroleum-related chemicals, depth to groundwater, and resources to be protected.

The following soil cleanup levels are applicable to the FS6B area and will be used as screening levels for the proposed soil sampling investigation:

Human Health (Residential Use): The PTMP calls for a mixture of residential, commercial, and recreational land uses within the FS6B area. Cleanup levels for residential land use are more stringent than cleanup levels for both recreational and commercial/industrial land use (EKI 2002). Thus, cleanup to residential use standards would be protective of recreational and commercial/industrial site use as well. Residential cleanup levels are also being considered so that the site may be available for unrestricted use.

Ecological (Freshwater Ecological Protection Zone): A small portion of the FS6B area is included in the Freshwater Ecological Protection Zone as defined in the RWQCB Order

because of its proximity to the Tennessee Hollow Creek restoration area. These cleanup levels are applicable to FS6B5, and a portion of both FS6B8 and FS6B9.

Ecological (Buffer Zone and Special Status): Per the Cleanup Levels Document, a small portion of the FS6B area falls within both the Buffer Zone and the Special Status ecological cleanup areas. The Special Status cleanup levels are applicable to portions of FS6B4 and FS6B5. The Buffer Zone cleanup levels are applicable to FS6B5, FS6B7, FS6B8, and FS6B9.

Groundwater Protection to Maintain Drinking Water Standards (<5 feet above groundwater): The majority of the FS6B area is within the Northeastern Groundwater Area. FS6B subarea 7 falls within the Crissy Field Groundwater Area, but it is on the border with the Northeastern Groundwater Area; therefore, drinking water standards will be assumed for all subareas of FS6B. SCRs from the RWQCB Order for protection of groundwater to maintain drinking water standards at the Presidio are applicable to the FS6B area. Shallow groundwater at the FS6B area has been encountered at depths as shallow as between 2 and 5 feet bgs; therefore, a depth to groundwater of <5 feet is assumed to evaluate the leaching potential from soil to groundwater.

Metals Background Concentrations for Colma Formation: The predominant lithology in the area is the Colma Formation. In the Cleanup Levels Document, two types of background concentrations were developed: screening levels to be used for site characterization purposes and threshold levels to be applied as cleanup levels. These background metals concentrations are applicable to all of the FS6B subareas.

The applicable soil cleanup levels for FS6B and background metals concentrations are presented in Table 4-2. Tables 1, 2, and 4 of the CRWQCB Order and Tables 6-5, 7-2, and 7-5 of the Cleanup Levels Document provide the soil cleanup levels and background concentrations presented in this table. For each compound and FS6B subarea, the most stringent of the applicable human health, ecological, and groundwater protection criteria will be selected as the screening level for the subarea. In the case of metals, the data collected at FS6B will be compared with the screening levels provided in Table 4-2 for site characterization purposes as well as the background threshold concentrations and other applicable cleanup levels.

The *Presidio-Wide Quality Assurance Project Plan, Sampling and Analysis Plan* (Presidio-Wide QAPP/SAP, Presidio Trust 2001) analytical reporting limits and laboratory detection limits are also listed in Table 4-2. Although in several cases the QAPP/SAP analytical reporting limit exceeds the cleanup level, the laboratory detection limits are below the cleanup level for all compounds listed.

In RAP5, final cleanup levels for FS6B will be presented and used to select COCs and evaluate remedial action associated with future site use.

Table 4-1

Summary of Sampling Approach, Fill Site 6B

Fill Site 6B Subarea	Demolished Buildings Within Fill Site 6B	Soil Data Available?	Current Land Use And Building Numbers	Number Of Samples Proposed
6B1	1010, 1011, and 1082	no	vacant	6 soil borings proposed 6 samples from 0 to 6 inches bgs 6 samples from fill material 6 samples from native material analyzed for metals, PAHs, PCBs, pesticides, and TPH
6B2	1006 and 1049	no	vacant	6 exploratory test pits proposed 6 samples from 0 to 6 inches bgs 6 samples from fill material 6 samples from native material analyzed for metals, PAHs, PCBs, pesticides, and TPH
6B3	1041, 1042, 1043, 1044, 1045, 1046, 1048, and 1080	yes	parking lot	No additional sampling proposed
6B4	1017, 1018, 1019, 1023, 1025, 1027, 1029, 1031, 1037, 1038, and 1039	no	residential 1027 and 1028	2 soil borings and 7 exploratory test pits proposed 9 samples from 0 to 6 inches bgs 6 samples from fill material 6 samples from native material analyzed for metals, PAHs, PCBs, pesticides, and TPH
6B5	266, 270, 1032, 1033, 1034, 1070, and 1071	no	residential 1029 and 1030	6 soil borings proposed 6 samples from 0 to 6 inches bgs 6 samples from fill material 6 samples from native material analyzed for metals, PAHs, PCBs, pesticides, and TPH. Samples from LF6SB222 only will also be analyzed for BTEX
6B6	219 and an unidentified 1934-era building	no	vacant	3 exploratory test pits proposed 3 samples from 0 to 6 inches bgs 3 samples from fill material 3 samples from native material analyzed for metals, PAHs, PCBs, pesticides, and TPH

Table 4-1

Summary of Sampling Approach, Fill Site 6B

Fill Site 6B Subarea	Demolished Buildings Within Fill Site 6B	Soil Data Available?	Current Land Use And Building Numbers	Number Of Samples Proposed
6B7	M19, M28, and M34	no	office/commercial and parking 1167	4 soil borings proposed 4 samples from 0 to 6 inches bgs 4 samples from fill material 4 samples from native material analyzed for metals, PAHs, PCBs, pesticides, and TPH
6B8A	1035	no	vacant	1 exploratory test pit proposed 1 sample from 0 to 6 inches bgs 1 sample from fill material 1 sample from native material analyzed for metals, PAHs, PCBs, pesticides, and TPH
6B8B	1066, 1068, and 1069	yes	parking	No additional sampling proposed
6B8C	1067	no	vacant	1 soil boring and 2 exploratory test pits proposed 3 samples from 0 to 6 inches bgs 3 samples from fill material 3 samples from native material analyzed for metals, BTEX, PAHs, PCBs, pesticides, and TPH
6B9	None	yes	parking lot	2 soil borings and 5 exploratory test pits proposed 7 samples from 0 to 6 inches bgs 7 samples from fill material 7 samples from native material analyzed for metals, PAHs, PCBs, pesticides, and TPH

bgs = below ground surface
BTEX = benzene, toluene, ethylbenzene, and xylenes
metals = Title 22 metals
PAHs = polycyclic aromatic hydrocarbons
PCBs = polychlorinated biphenyls
TPH = total petroleum hydrocarbons as gasoline, diesel, and fuel oil

Table 4-2
Summary of Soil Cleanup Levels Applicable to Fill Site 6B
Presidio of San Francisco, California

Constituent	Applicable Cleanup Levels to be Used as Screening Levels						Presidio Background Screening and Threshold Level Metals Concentrations for Colma Lithology (mg/kg)	Reporting/Detection Limits	
	Human Health Residential Cleanup Level (mg/kg)	Cleanup Level for Soil to Maintain Drinking Water Standard in Groundwater (<5 feet above groundwater) (mg/kg)	Ecological Buffer Zone Cleanup Level (mg/kg)	Special Status Ecological Cleanup Level (mg/kg)	Freshwater Ecological Protection Zone Terrestrial Receptors Cleanup Level (mg/kg)	Freshwater Ecological Protection Zone Freshwater Aquatic Receptors Cleanup Level (mg/kg)		QAPP Analytical Reporting Limits (mg/kg)	Laboratory Detection Limit (mg/kg)
	Applicable to All FS6B Subareas		Applicable to FS6B5, B7, B8, and B9	Applicable to FS6B4 and 6B5	Applicable to FS6B5, FS6B8, and 6B9		Applicable to All FS6B Subareas		
Petroleum Hydrocarbons and Gasoline-related VOCs [1]									
TPH as gasoline (C_7-C_{12})	1,030	100	--	--	610	140	--	1.0	0.001
TPH as diesel (C_{12}-C_{24})	1,380	115	--	--	700	144	--	10	0.001
TPH as fuel oil (C_{24}-C_{36}) [2]	1,900	160	--	--	980	144	--	10	0.005
Benzene	0.6	0.005	--	--	40	0.79	--	0.005	0.005
Toluene	530	1	--	--	270	3	--	0.010	0.005
Ethylbenzene	840	13	--	--	125	15	--	0.005	0.005
Total Xylenes	1,080	33	--	--	55	5.7	--	0.005	0.005
MTBE	--	--	--	--	--	--	--	0.02	0.020
Metals [3]							Screening |Threshold		
Antimony	29	--	5	5	--	--	3.0 | 3.0	0.2	0.05
Arsenic	0.36	--	64	10	--	--	3.9 | 6.2	0.2	0.06
Barium	5,000	--	500	320	--	--	99 | 180	0.1	0.03
Beryllium	140	--	10	10	--	--	0.46 | 0.99	0.1	0.01
Cadmium	1.7	--	0.23	0.017	--	--	0.80 | 0.8	0.1	0.06
Chromium	1,200	--	23	4	--	--	95 | 140	0.2	0.02
Cobalt	4,000	--	48	20	--	--	16 | 21	0.1	0.02
Copper	--	--	120	30	--	--	24 | 49	0.2	0.02
Lead	400	--	300	160	50	--	5.2 | 7.5	0.1	0.15
Mercury	20	--	1.6	0.4	--	--	0.2 | 0.2	0.1	0.004
Molybdenum	360	--	300	12	--	--	2.0 | 2.0	0.1	0.05
Nickel	1,400	--	71	30	--	--	83 | 110	0.2	0.04
Selenium	360	--	1.1	0.2	--	--	0.5 | 0.5	0.2	0.03
Silver	360	--	2	2	--	--	1.0 | 1.0	0.1	0.03
Thallium	5.7	--	1	0.15	--	--	1.0 | 1.0	0.1	0.02
Vanadium	650	--	5	2	--	--	62 | 90	1.0	0.03
Zinc	22,000	--	50	4	--	--	43 | 60	0.2	0.2

Table 4-2
Summary of Soil Cleanup Levels Applicable to Fill Site 6B
Presidio of San Francisco, California

Constituent	Applicable Cleanup Levels to be Used as Screening Levels						Presidio Background Screening and Threshold Level Metals Concentrations for Colma Lithology (mg/kg)	Reporting/Detection Limits	
	Human Health Residential Cleanup Level (mg/kg)	Cleanup Level for Soil to Maintain Drinking Water Standard in Groundwater (<5 feet above groundwater) (mg/kg)	Ecological Buffer Zone Cleanup Level (mg/kg)	Special Status Ecological Cleanup Level (mg/kg)	Freshwater Ecological Protection Zone Terrestrial Receptors Cleanup Level (mg/kg)	Freshwater Ecological Protection Zone Freshwater Aquatic Receptors Cleanup Level (mg/kg)		QAPP Analytical Reporting Limits (mg/kg)	Laboratory Detection Limit (mg/kg)
	Applicable to All FS6B Subareas		Applicable to FS6B5, B7, B8, and B9	Applicable to FS6B4 and 6B5	Applicable to FS6B5, FS6B8, and 6B9		Applicable to All FS6B Subareas		
PAHs [4]									
Acenaphthene	2,700	--	40	30	--	--	--	0.33	0.007
Acenaphthylene	--	--	40	30	--	--	--	0.33	0.008
Anthracene	5,900	308	40	30	--	--	--	0.33	0.005
Benzo(a)anthracene	0.27	8	40	30	--	--	--	0.33	0.005
Benzo(a)pyrene	0.027	3	40	30	0.3	--	--	0.33	0.005
Benzo(b)fluoranthene	0.27	23	40	30	--	--	--	0.33	0.005
Benzo(g,h,i)perylene	620	5,040	40	30	--	--	--	0.33	0.005
Benzo(k)fluoranthene	0.27	23	40	30	--	--	--	0.33	0.005
Benzyl alcohol	14,000	--	40	1	--	--	--	0.33	0.02
Chrysene	2.7	54	40	30	--	--	--	0.33	0.005
Dibenz(a,h)anthracene	0.078	--	40	30	--	--	--	0.33	0.005
Dibenzofuran	910	--	--	--	--	--	--	0.33	0.02
Fluoranthene	820	316	40	30	--	--	--	0.33	0.005
Fluorene	770	60	40	30	--	--	--	0.33	0.005
Indeno(1,2,3-cd)pyrene	0.27	--	40	30	--	--	--	0.33	0.005
2-methylnaphthalene	--	--	40	30	--	--	--	0.33	0.007
4-methylphenol (p-Cresol)	260	--	50	50	--	--	--	0.33	0.04
Naphthalene	480	9	40	30	--	--	--	0.33	0.005
n-nitrosodiphenylamine	43	--	65	20	--	--	--	0.33	0.01
Pentachlorophenol	5	--	3.5	3	--	--	--	1.6	0.17
Phenanthrene	600	86	40	30	--	--	--	0.33	0.005
Phenol	27,000	--	109	30	--	--	--	0.33	0.02
Pyrene	620	241	40	30	--	--	--	0.33	0.005

Table 4-2
Summary of Soil Cleanup Levels Applicable to Fill Site 6B
Presidio of San Francisco, California

Constituent	Applicable Cleanup Levels to be Used as Screening Levels						Presidio Background Screening and Threshold Level Metals Concentrations for Colma Lithology (mg/kg)	Reporting/Detection Limits	
	Human Health Residential Cleanup Level (mg/kg)	Cleanup Level for Soil to Maintain Drinking Water Standard in Groundwater (<5 feet above groundwater) (mg/kg)	Ecological Buffer Zone Cleanup Level (mg/kg)	Special Status Ecological Cleanup Level (mg/kg)	Freshwater Ecological Protection Zone Terrestrial Receptors Cleanup Level (mg/kg)	Freshwater Ecological Protection Zone Freshwater Aquatic Receptors Cleanup Level (mg/kg)		QAPP Analytical Reporting Limits (mg/kg)	Laboratory Detection Limit (mg/kg)
	Applicable to All FS6B Subareas		Applicable to FS6B5, B7, B8, and B9	Applicable to FS6B4 and 6B5	Applicable to FS6B5, FS6B8, and 6B9		Applicable to All FS6B Subareas		
Volatile Organic Compounds									
Acetone	0.24	--	68,000	8,500	--	--	--	0.01	0.002
2-butanone (MEK)	3.8	--	15,000	4,200	--	--	--	0.01	0.002
Carbon disulfide	200	--	14,000	934	--	--	--	0.005	0.004
1,4-dichlorobenzene	0.13	--	74	20	--	--	--	0.33	0.001
p-isopropyltoluene (p-cymene)	130	--	600	200	--	--	--	--	0.001
Methylene chloride	0.076	--	17,000	459	--	--	--	0.005	0.001
1,2,3-trichlorobenzene	15	--	68	20	--	--	--	--	0.001
1,2,4-trichlorobenzene	15	--	74	20	--	--	--	--	0.001
Trichlorofluoromethane	40	--	--	--	--	--	--	--	0.001
1,1,1-trichloroethane	8	--	730,000	9,700	--	--	--	0.01	0.001
Pesticides and PCBs									
PCBs (Aroclor 1254)	0.16	--	0.23	0.033	--	--	--	0.033	0.003
Aldrin	0.029	--	0.1	0.0039	--	--	--	0.002	0.0004
alpha-BHC	0.18	--	2.4	0.062	--	--	--	0.002	0.0005
beta-BHC	0.32	--	2.4	0.062	--	--	--	0.002	0.0004
delta-BHC	0.18	--	2.4	0.062	--	--	--	0.002	0.0003
Chlordane	0.37	--	0.04	0.0090	--	--	--	0.002	0.0006
4,4'-DDD	2.0	--	0.53	0.049	--	--	--	0.004	0.0009
4,4'-DDE	1.4	--	0.61	0.098	--	--	--	0.004	0.0008
4,4'-DDT	1.4	--	0.53	0.0082	--	--	--	0.004	0.001
Dieldrin	0.030	--	0.26	0.039	--	--	--	0.004	0.0009
Endosulfan	370	--	3.3	1.1	--	--	--	0.002	0.0007
Endosulfan sulfate	370	--	3.3	1.1	--	--	--	0.004	0.0006
Endrin	18	--	0.11	0.004	--	--	--	0.004	0.002
Endrin aldehyde	18	--	0.11	0.004	--	--	--	0.004	0.001
Endrin ketone	18	--	0.11	0.004	--	--	--	0.004	0.0008

Table 4-2
Summary of Soil Cleanup Levels Applicable to Fill Site 6B
Presidio of San Francisco, California

Constituent	Applicable Cleanup Levels to be Used as Screening Levels						Presidio Background Screening and Threshold Level Metals Concentrations for Colma Lithology (mg/kg)	Reporting/Detection Limits	
	Human Health Residential Cleanup Level (mg/kg)	Cleanup Level for Soil to Maintain Drinking Water Standard in Groundwater (<5 feet above groundwater) (mg/kg)	Ecological Buffer Zone Cleanup Level (mg/kg)	Special Status Ecological Cleanup Level (mg/kg)	Freshwater Ecological Protection Zone Terrestrial Receptors Cleanup Level (mg/kg)	Freshwater Ecological Protection Zone Freshwater Aquatic Receptors Cleanup Level (mg/kg)		QAPP Analytical Reporting Limits (mg/kg)	Laboratory Detection Limit (mg/kg)
	Applicable to All FS6B Subareas		Applicable to FS6B5, B7, B8, and B9	Applicable to FS6B4 and 6B5	Applicable to FS6B5, FS6B8, and 6B9		Applicable to All FS6B Subareas		
Pesticides and PCBs (continued)									
gamma BHC (Lindane)	0.44	--	0.37	0.010	--	--	--	0.002	0.0005
Heptachlor	0.12	--	3.7	0.017	--	--	--	0.002	0.0005
Heptachlor epoxide	0.088	--	3.7	0.017	--	--	--	0.002	0.0005
Isodrin	0.029	--	0.1	0.0039	--	--	--	--	0.001
Methoxychlor	310	--	18	0.44	--	--	--	0.02	0.007

Notes

[1] Applicable cleanup levels for TPH and BTEX from Tables 1, 2, and 4 in Order No. R2-2003-0080 Site Cleanup Requirements, Presidio of San Francisco (RWQCB 2003).

[2] TPH as fuel oil uses a motor oil standard for carbon range C24-C36.

[3] Screening and threshold levels for metals compiled from Table 6-5 of the Cleanup Levels Document (EKI 2002). Detected metals concentrations will be screened against the screening levels.

[4] Applicable cleanup levels for PAHs compiled from Tables 1, 2, and 4 in Order No. R2-2003-0080 Site Cleanup Requirements, Presidio of San Francisco (RWQCB 2003) for petroleum-related PAHs and Table 7-2 from the Cleanup Levels Document (EKI 2002) for non-petroleum related PAHs. Because PAHs at the Study Area could be derived for petroleum or non-petroleum related sources (e.g., fill material), the lowest applicable cleanup levels from these two sources are selected as the applicable cleanup levels for PAHs.

mg/kg = milligrams per kilogram

MTBE = methyl tert-butyl ether

PAHs = polycyclic aromatic hydrocarbons

PCBs = polychlorinated biphenyls

TPH = total petroleum hydrocarbons

-- = No cleanup level or reporting limit available

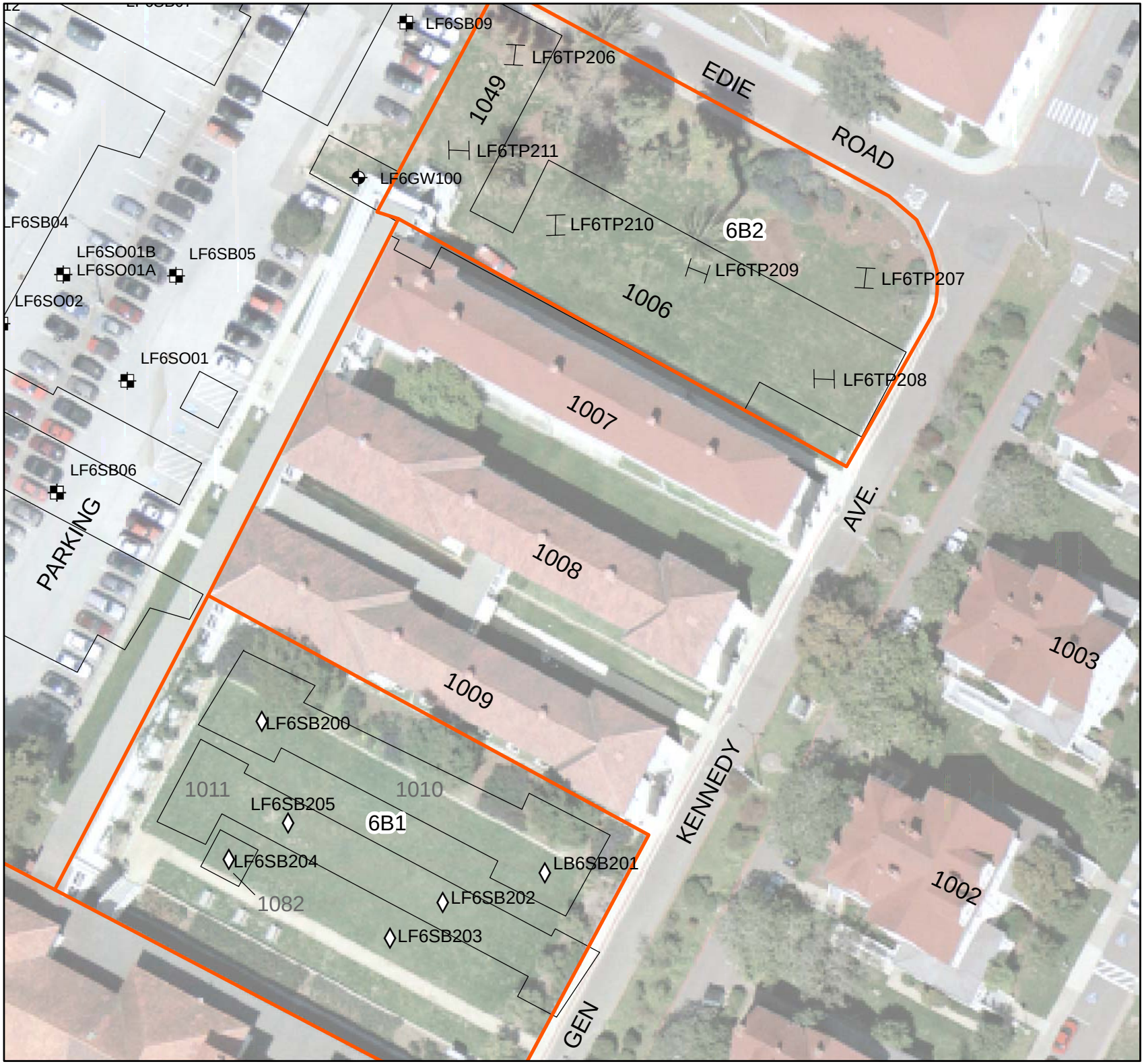


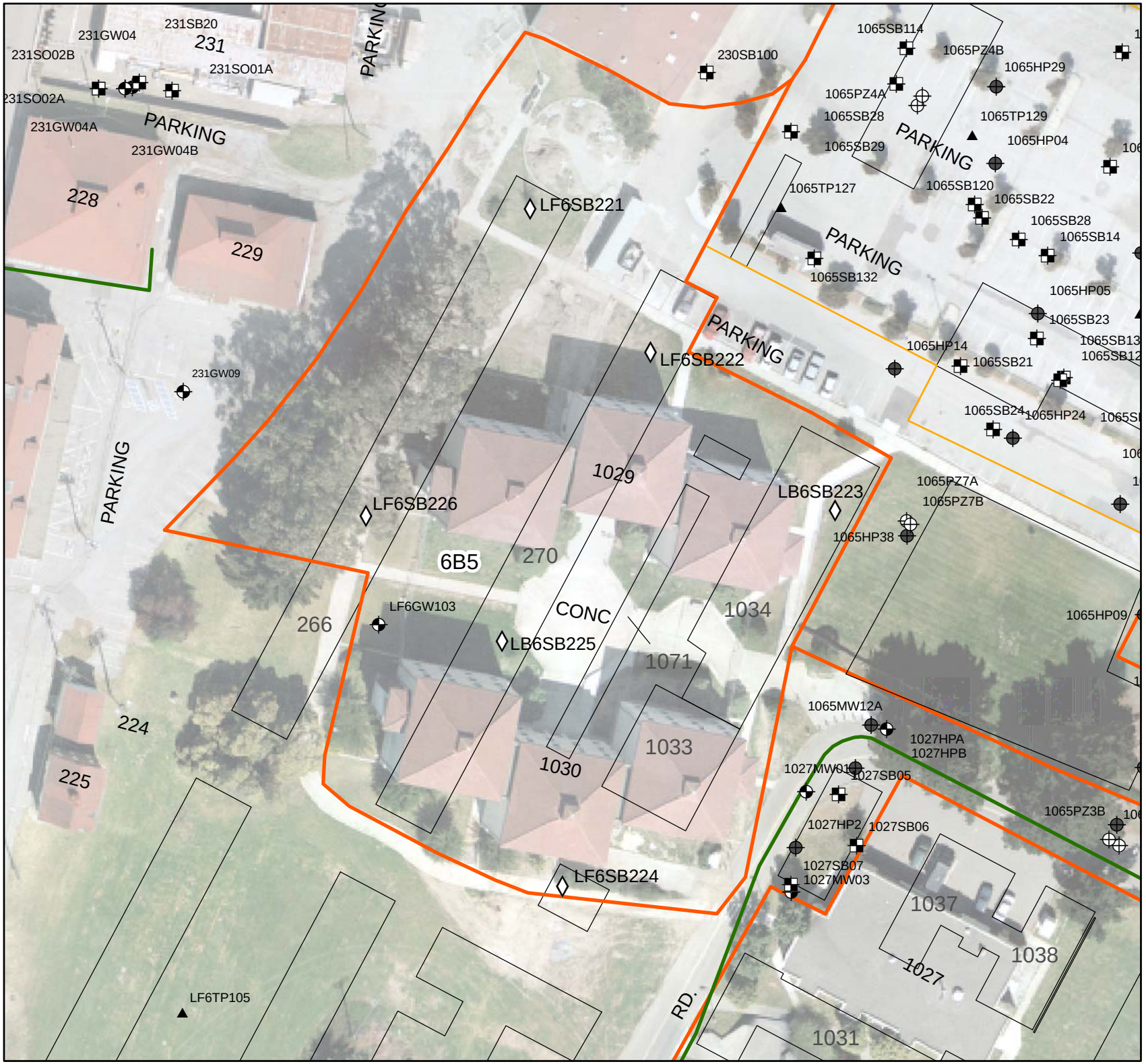
Figure 4-1
Fill Site Subareas 6B1 and 6B2
Proposed Sampling Locations
Presidio of San Francisco, CA

CDM

Notes:
1. All locations are approximate.
2. Basemap was provided by the Presidio Trust.

Figure 4-2
Fill Site Subarea 6B4
Proposed Sampling Locations
Presidio of San Francisco, CA

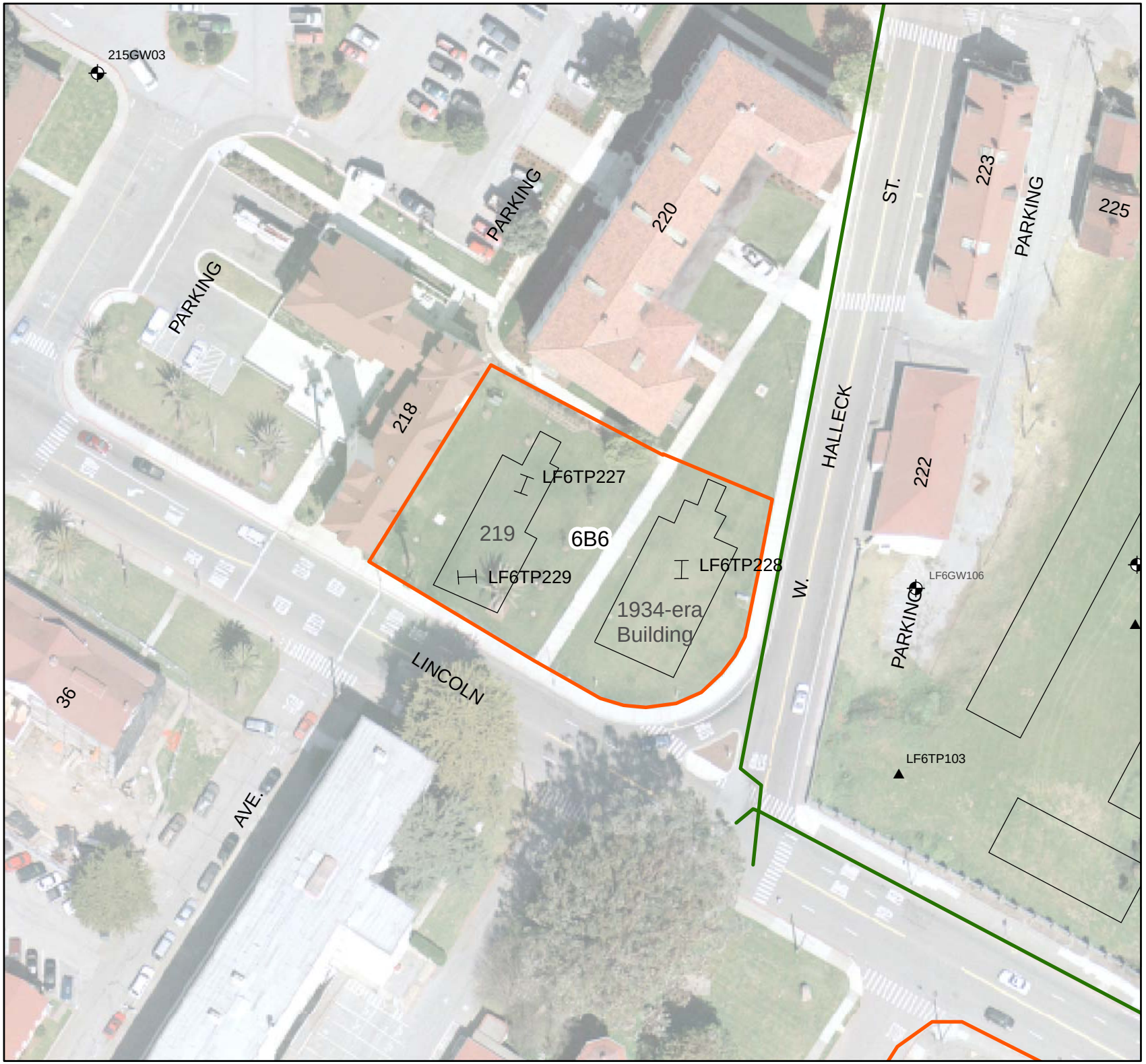
CDM



Notes:
1. All locations are approximate.
2. Basemap was provided by the Presidio Trust.

Figure 4-3
Fill Site Subarea 6B5
Proposed Sampling Locations
Presidio of San Francisco, CA

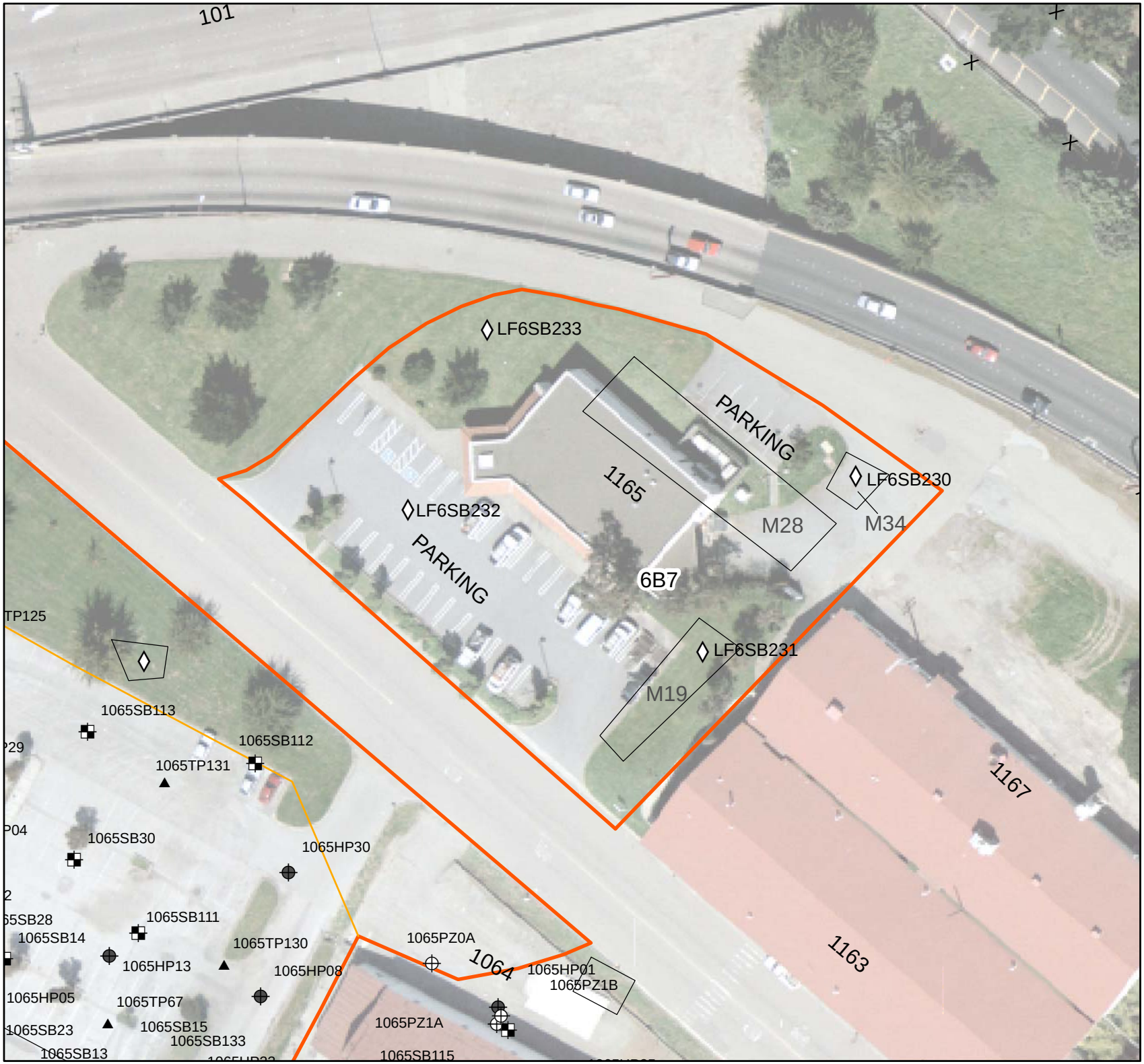
CDM



Notes:
1. All locations are approximate.
2. Basemap was provided by the Presidio Trust.

Figure 4-4
Fill Site Subarea 6B6
Proposed Sampling Locations
Presidio of San Francisco, CA

CDM



N

0 20 40 80

Approximate Feet

Legend

- Proposed Fill Site 6B Boundary
- Footprint of Demolished Buildings With Building Numbers
- Hydropunch
- Monitoring Well
- Piezometer
- Soil Boring
- Test Pit
- Proposed Soil Boring Locations

Notes:

1. All locations are approximate.
2. Basemap was provided by the Presidio Trust.

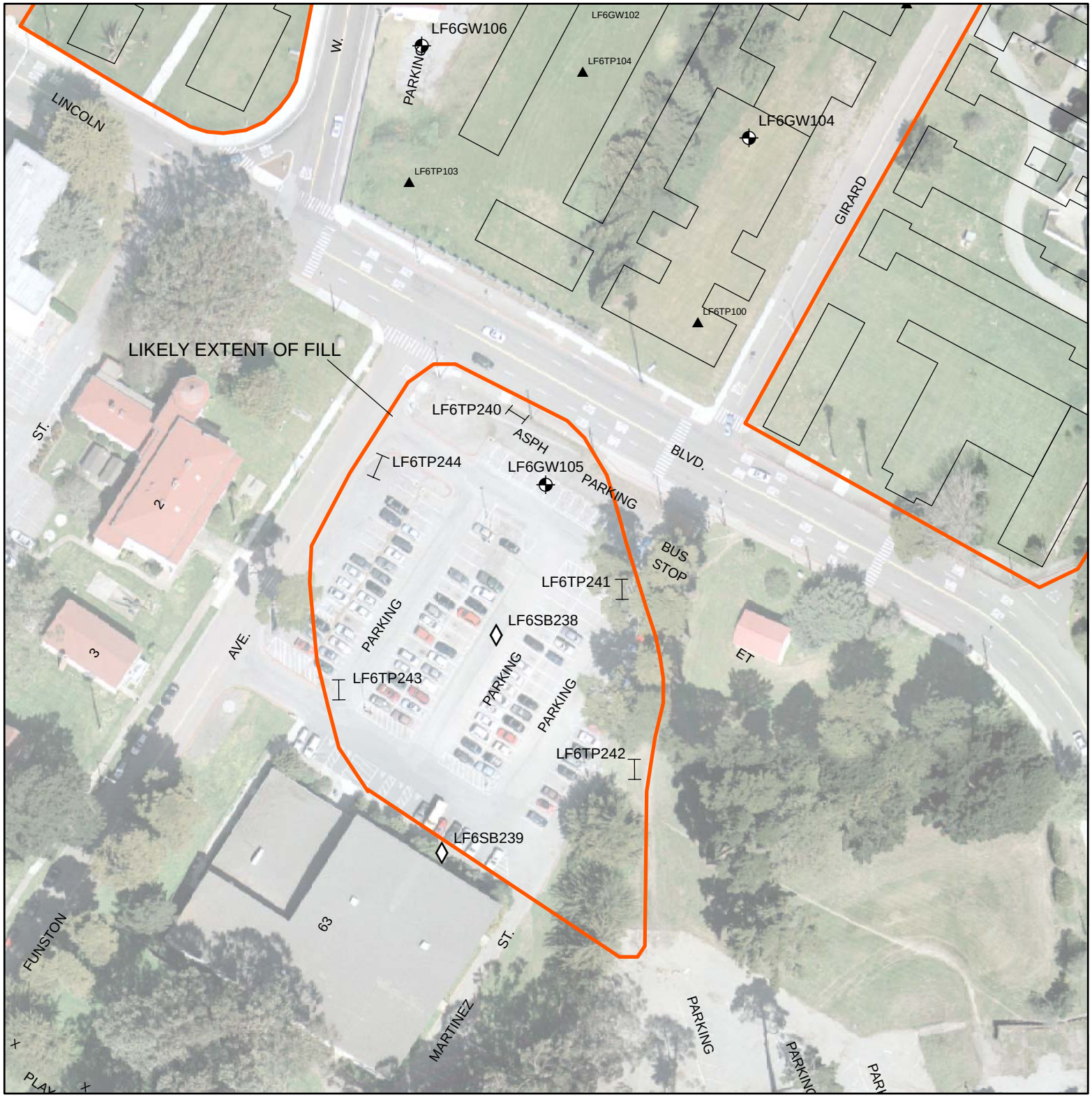
Figure 4-5
Fill Site Subarea 6B7
Proposed Sampling Locations
Presidio of San Francisco, CA

CDM

Notes:
1. All locations are approximate.
2. Basemap was provided by the Presidio Trust.

Figure 4-6
Fill Site Subareas 6B8A and 8C
Proposed Sampling Locations
Presidio of San Francisco, CA

CDM



N

0 25 50 100

Approximate Feet

Legend

- Proposed Fill Site 6B Boundary
- Footprint of Demolished Buildings With Building Numbers
- Hydropunch
- Monitoring Well
- Piezometer
- Soil Boring
- Test Pit
- Proposed Soil Boring Locations To Be Sampled
- Proposed Trench Locations (as conditions allow)

Notes:

1. All locations are approximate.
2. Basemap was provided by the Presidio Trust.

Figure 4-7
Fill Site Subarea 6B9
Proposed Sampling Locations
Presidio of San Francisco, CA

CDM

Section 5
Field Procedures, Analytical Methods, and Schedule

5.1 Field Procedures

Included in this section are the field procedures and sampling methods that will be used during the planned investigation.

5.1.1 Subsurface Clearance

Prior to the start of soil sampling activities, all proposed locations will be cleared for subsurface obstructions and utilities. CDM will mark all proposed locations on asphalt or concrete with white spray paint, and all proposed locations in unpaved areas will be marked with a wooden stake wrapped with plastic flagging. The white spray paint marking will consist of a one-foot diameter circle and the borehole identification number. The borehole identification number will be written on the flagging on the wooden stakes. The utility clearance will be performed by the Trust and CDM will notify the Trust of the need for the clearance so that it is completed approximately one week prior to the start of sampling activities.

5.1.2 Soil Sampling

Each soil boring will be continuously cored with a core barrel lined with a clear acetate sleeve, so that the interface between fill and native material will be more easily ascertained. Soil samples will be collected from within 6 inches of the surface, within fill immediately above the interface with native material, and from the native material at all proposed sampling locations. The soil samples will be collected through a combination of hand sampling, direct-push sampling, and sampling directly from the test pits. Soil sampling (including Encore® sampling) will be performed in accordance with the Trust's Environmental Standard Operating Procedure (SOP) No. 001 – Soil Sampling. All soil borings and test pits will be logged in accordance with the Trust's Environmental SOP No. 009 – Soil Boring Log Preparation.

For the soil samples to be analyzed for TPHg and VOCs, three Encore® samplers will be filled with soil for each sample.

Surface Soil Sampling

The 0.5 foot soil samples will be collected using a hand-operated stainless steel core sampler capable of retrieving undisturbed soil samples. The sampler will be lined with a stainless steel sampling sleeve. The surface soil will be removed to a depth below the

root zone and the sampler, lined with a stainless steel sample sleeve, will be inserted into the soil vertically to a depth of approximately 6 inches and rotated. The sampler will be removed and the ends of each sampling sleeve capped with Teflon squares and plastic end caps. The process will be repeated two more times at each location within a 12 inch diameter to collect a sufficient number of sample sleeves for the required analyses. The Encore® samples will be collected from one of the sleeves prior to its being capped.

Subsurface Soil Sampling

The samples collected from the fill and native intervals at each soil boring location (see Figures 4-1 through 4-3, 4-5, 4-6, and 4-7) will be collected using a truck-mounted direct push sampling system. A stainless steel core barrel lined with a clear acetate liner will be hydraulically pushed until the top of native material has been penetrated. The core barrel will be retrieved from the borehole and the liner removed from the core barrel. The soil within the liner will be lithologically logged, with special emphasis on any material that could be classified as building debris (e.g., brick, concrete, metal, roofing material). The bottom one-foot portion of the liner within fill material will be cut and capped with Teflon squares and plastic end caps for submittal to the laboratory for analysis. It is approximated that soil samples will be collected from approximately 5 to 7 feet bgs in all FS6B subareas except for FS6B9, where it is approximated that samples will be collected from approximately 12 feet bgs to more than 20 feet bgs.

Sampling from Test Pits

Samples will also be collected from test pits at FS6B2, FS6B4, FS6B6, FS6B8A, and FS6B9. The surface sample will be collected as stated above prior to excavation of each test pit. The test pits will be dug using a backhoe and all materials removed from the test pits will be stockpiled on clean plastic placed adjacent to the work area. Two subsurface samples will be collected from each location: one from within the fill material and the other from within the native material. The samples will be collected directly from the backhoe bucket using a stainless steel trowel or disposable plastic spoon. Care will be taken to collect soil from the middle of the filled bucket so that soil is not collected that has come in contact with the bucket itself. The sample will be placed into 8-oz glass jars for submittal to the analytical laboratory. All material stockpiled adjacent to the test pit will be replaced into the hole.

5.1.3 Field Quality Control Samples

The purpose of collecting field quality control (QC) samples is to demonstrate the reliability and defensibility of data. QC samples collected in the field will be used to assess the overall quality of the sampling and analysis process. Field QC samples will

include source-water blanks, trip blanks, equipment rinsate blanks, field duplicate samples, and matrix spike and matrix spike duplicate (MS/MSD) samples.

Source-Water Blanks

Source-water blanks are used to evaluate the quality of the water used for the last rinse in the equipment decontamination process. The purpose of the source-water blank is to confirm that no contamination, that may have originated in the rinsing water, was added to the sampling tools. The source-water blank consists of deionized water used for the final rinse, and is analyzed for the same analytical suite as the samples collected with the equipment. Source-water blanks are from the same source water lot and are collected at a frequency of one per sampling event. Multiple containers of the same lot number of deionized or distilled water are considered the same source.

Trip Blanks

A trip blank demonstrates that contamination is not originating from sample containers or from any other factor during sample transport. A trip blank originates at the laboratory as a set of 40-milliliter vials typically used for VOC analysis. The vial is filled at the laboratory with reagent-grade, organic-free water. The trip blanks are then transported to the site with the empty containers that will be used for sample collection. Trip blanks are stored at the site with the empty sample containers until the proposed field samples have been collected. One trip blank will accompany each sample transport container that holds water samples for volatile compound analysis (VOCs or TPHg) back to the laboratory. The trip blank is not opened until it is returned to the laboratory. Trip blanks are analyzed for the same volatile analytes as the samples in that container.

Equipment Rinsates

Equipment rinsates demonstrate whether the decontamination procedure is effective in removing contaminants from field equipment used to collect samples. An equipment rinsate is collected after a sampling device is subjected to standard decontamination procedures. Water used for the final rinse of the decontamination procedure will be poured over or through the sampling equipment, collected in a sample container, and sent to the laboratory for analysis.

Contamination in the equipment rinsate indicates that the cleaning procedure for field equipment is not sufficient, allowing for the possibility of cross-contamination. One equipment rinsate will be collected per sampling device type per day of sampling. The total number of equipment rinsates will not exceed 10 percent of the total number of samples collected. Rinsates will be analyzed for the same parameters as the soil samples collected. During the data validation process, the results of equipment rinsate analyses will be used to qualify data or to evaluate analyte levels in the field samples.

Field Duplicates

Field duplicate samples are two samples collected at the same time, from the same source at the same depth or sample location. Field duplicates are submitted to the project laboratory as separate samples (i.e., blindly). The purpose of collecting field duplicates is to assess the consistency of the overall sampling effort, including collection, shipping, and analysis; the purpose of submitting them blindly to the laboratory is to assess the consistency or precision of the laboratory's analytical system. Field duplicates will be collected at a frequency of one for every 10 samples of the same matrix.

So that the laboratory analyzes aliquots of soil from immediately adjacent portions of the submitted soil sleeve(s), the portion of the sleeve(s) from which the soil is to be taken for analysis will be marked directly on the sleeve(s) with an indelible marker. The chain-of-custody will be annotated instructing the laboratory to take the soil aliquots from the marked end of the sleeve(s). This will alleviate having aliquots being analyzed that are not actually duplicates.

Matrix Spike/Matrix Spike Duplicate Samples

MS/MSD samples measure matrix-specific method performance. An MS or MSD is prepared by the analytical laboratory by adding a known quantity of target analytes to a single field sample prior to sample digestion or extraction to determine how well the target analytes can be recovered from the sample matrix. The accuracy of the matrix-specific method may be determined by the recovery of the spiked analytes after native concentrations of the spike analytes are subtracted. If an MSD is analyzed, the matrix-specific precision of the method may also be calculated. In general, for organic analyses, an MS/MSD pair is prepared and analyzed; for inorganics, a single MS (and a laboratory duplicate) is prepared and analyzed with each laboratory analytical batch of samples (up to a maximum of 20 samples of a similar matrix).

For every 20 soil samples submitted to the laboratory for analysis, one sample will be submitted in a double volume amount for the lab to use for MS/MSD purposes.

5.1.4 Sampling Location Survey

A global positioning system device will be used in accordance with the Trust's Environmental SOP No. 013 – Location Survey, to determine the horizontal coordinates of all sampling locations.

5.1.5 Decontamination of Sampling Equipment

All re-useable sampling equipment that contacts potentially contaminated soil will be decontaminated between collection of each sample in accordance with the Trust's

Environmental SOP No. 014 – General Equipment Decontamination. Decontamination of downhole direct push equipment will consist of steam cleaning and hand sampling devices will be decontaminated with a phosphate-free detergent wash and a distilled or deionized water rinse. All decontamination fluids will be collected and stored in 55-gallon drums.

5.1.6 Management of Investigation-Derived Waste

A minimal amount of soil cuttings are anticipated to be produced during this field investigation. Soil cuttings from the direct push borings will be placed into 5-gallon plastic buckets with lids. All produced decontamination waste water will be placed into 55-gallon drums. All used personal protective equipment (PPE) will be placed in plastic bags and stored in labeled 55 gallon drums. All drums and plastic buckets will be labeled and stored at the hazardous waste storage area at the Central Magazine until analytical results have been received for the soil samples collected during this investigation. On the basis of the soil sample results, the soil, waste water, and PPE will be profiled and disposed in accordance with federal, state, and local regulations.

All drums and buckets will be labeled with the following information:

- Site location
- Contents (i.e., soil, water, PPE)
- Date the waste was generated
- Contact phone number.

5.1.7 Sample Containers, Preservation, and Holding Times

The type of sample containers, preservation requirements, minimum sample weight and maximum holding times are presented in Table 2-2 of Appendix 2 (Summary of Analytical Methods) of the Presidio-Wide QAPP/SAP (Presidio Trust 2001).

5.1.8 Sample Custody and Shipping Procedures

Labels will be affixed to all sample containers submitted to the laboratory that contain the following information:

- Project number
- Sample identification number
- Date and time of sample collection
- Preservatives used

- Initials of the sample collector

Labeled sample containers will be placed in plastic bags and transported in insulated coolers filled with a sufficient amount of double-bagged ice so that a temperature of 4 degrees Celsius plus or minus 2 degrees Celsius will be maintained until the cooler is received by the laboratory. Sample custody and shipping procedures will be performed in accordance with Section B3.3 of the Presidio-Wide QAPP/SAP (Presidio Trust 2001) and the Trust's Environmental Standard Operating Procedure (SOP) No. 015 – Packaging and Shipping Samples.

5.1.9 Field Documentation

The following guidelines will be observed in maintenance of all field documentation (including chain-of-custody forms, field forms, and the field logbook):

- Documentation will be completed in permanent ink.
- All entries will be legible.
- All errors will be crossed out with a single line. The lineout will then be initialed and dated by the person making the correction. Correction fluid or any other form of erasure will be used.

A record of all work performed in the field will be maintained in a hardcover, bound logbook with sequentially numbered pages. The front cover of the logbook will include the Trust's major work order number, the name of the contractor performing the work, and the name of the project manager. At a minimum, the following information will be recorded in the logbook:

- Name and affiliation of all personnel working at the site and any visitors to the site.
- Log and summary of daily activities and significant events.
- Notes of conversations with coordinating officials.
- References to other field logbooks or forms that contain specific information.

5.1.10 Validation of Laboratory Data

All laboratory data will be verified and validated in accordance with Section D1 of the Presidio-Wide QAPP/SAP (Presidio Trust 2001). All analytical data generated will be verified to identify inconsistencies or anomalous values and cursory validation will be performed on all data summary packages. Full data validation will be completed on data packages for a minimum of ten percent of the project samples.

5.2 Analytical Methods

All samples will be analyzed using the following analytical methods:

- TPHg (petroleum hydrocarbons in the C7 to C12 range) using U.S. EPA SW-846 Method 8015 Modified
- TPHd (petroleum hydrocarbons in the C12 to C24 range) using U.S. EPA SW-846 Method 8015 Modified with silica gel cleanup (SW-846 Method 3630C)
- TPHfo (petroleum hydrocarbons in the C24 to C36 range) using U.S. EPA SW-846 Method 8015 Modified with silica gel cleanup (SW3630C)
- Organochlorine pesticides using U.S. EPA SW-846 Method 8081A
- Polycyclic aromatic hydrocarbons using U.S. EPA SW-846 Method 8270SIM
- Polychlorinated biphenyls using U.S. EPA SW-846 Method 8082
- Title 22 Metals using U.S. EPA SW-846 Methods 6010/6020 and 7000 series.

In order to define the extent of benzene present in soil above cleanup levels within RU-B of the Building 1065 Area CAP, samples collected from FS6B8C and from proposed boring LF6SB222 in FS6B5 will also be analyzed for BTEX using U.S. EPA SW-846 Method 8260B.

If visibly stained or noticeably odorous soils are encountered during sampling within any of the other FS6B subareas, samples from those locations will also be analyzed for VOCs using U.S. EPA SW-846 Method 8260B.

5.3 Schedule

Once notice to proceed is given, CDM will contact the Trust to begin utilities clearance. It is assumed that the clearance will be completed within one week and final approval given to begin the subsurface soil investigation. The field sampling is estimated to be completed in 2 weeks.

As the analytical data is submitted, it will be validated as stated in Section 5.1.10. Within three months of completion of the data validation, a field sampling report will be submitted that documents performance of the field work, the results of the analytical analyses, any deviations from the work plan, and interpretation of the nature and extent of contaminants in soil at FS6B.

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